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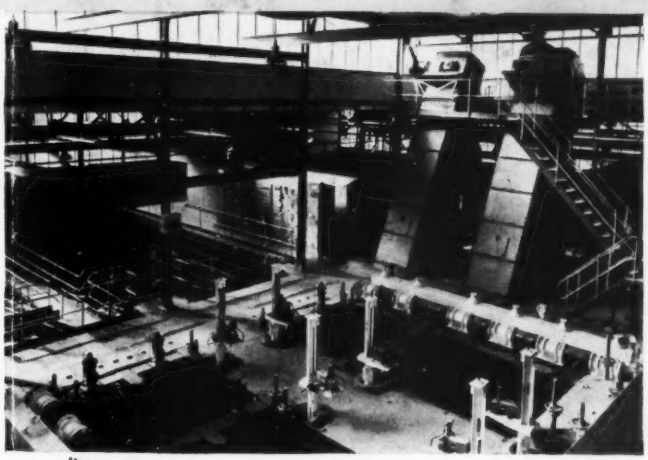

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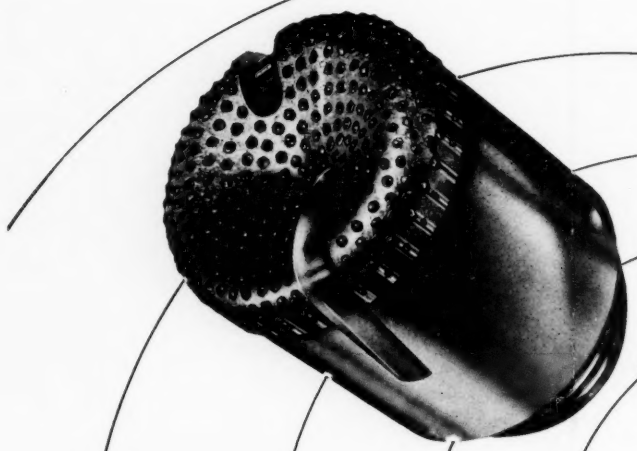

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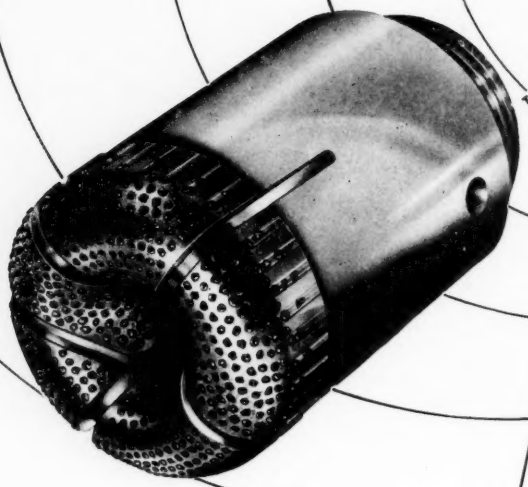

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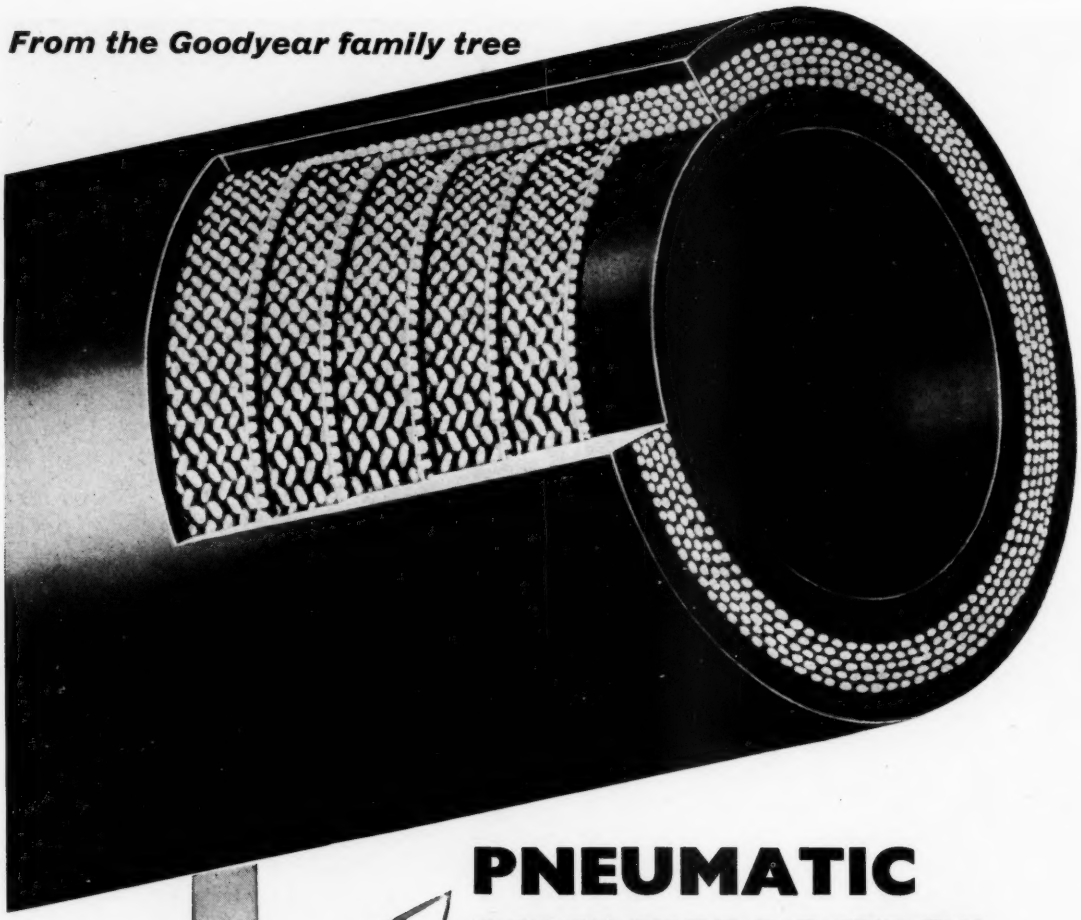

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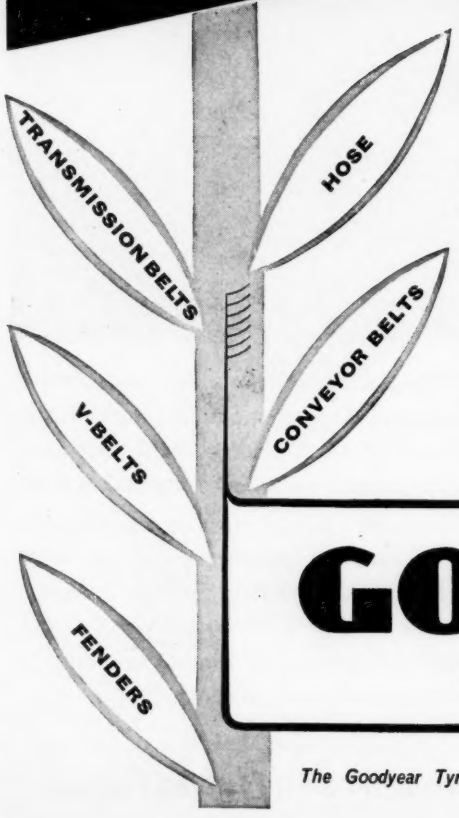

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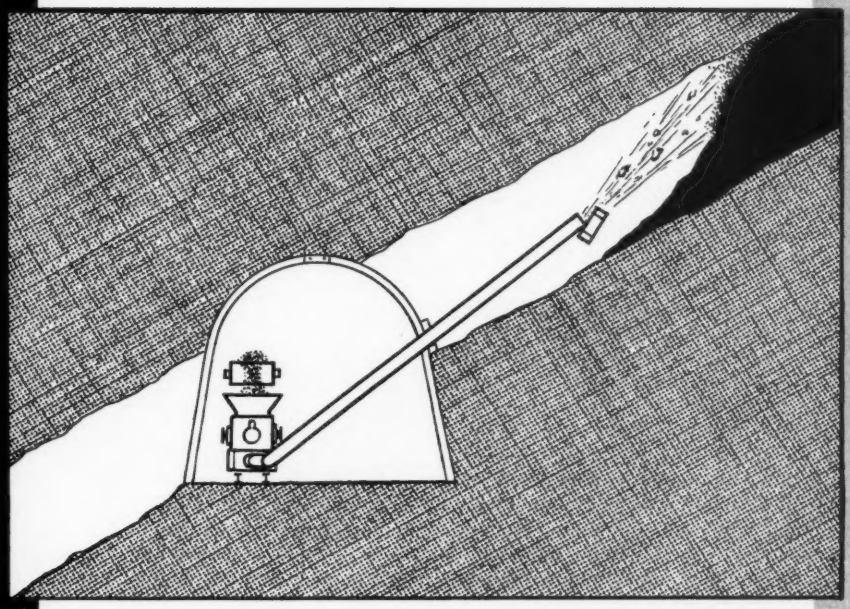

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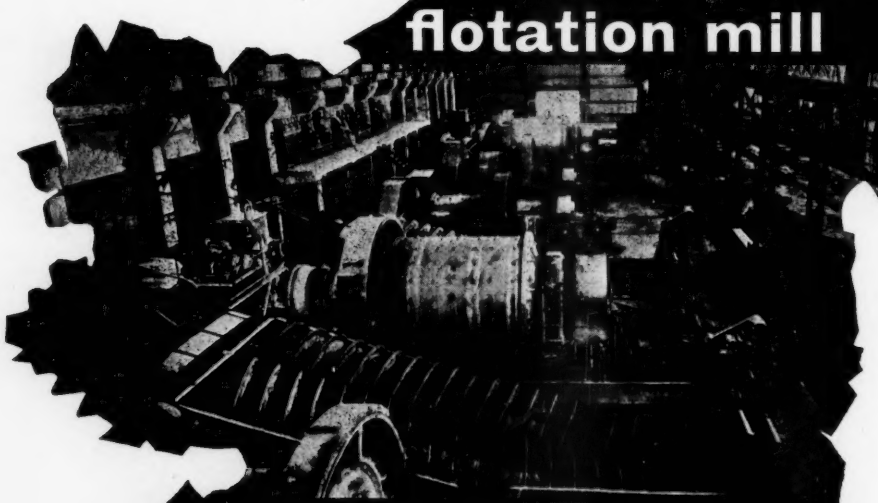

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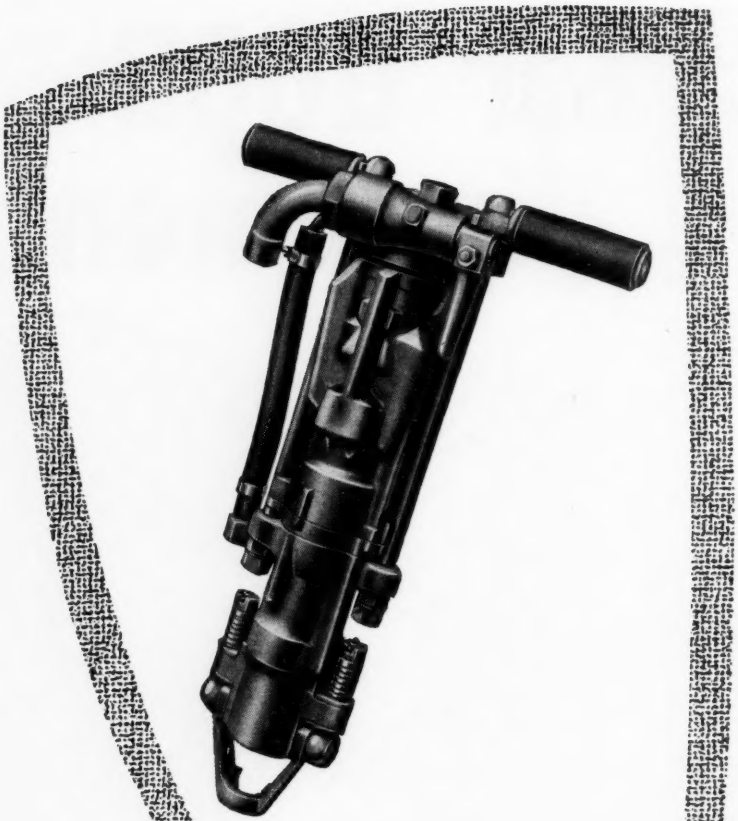

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London, August 5, 1960

In this issue . . .

Mining's Role in British Guiana's Development Programme	143
Go-Ahead for Algerian Ferrous Plant ...	144
Training Technical Staff for Russia's Mineral Industries	144
Potentials of Australian Coal	145
War on Overtime in Hungary's Mines ...	145
Gold in Mosquitia	146
Finnish Mineral Projects	148
World Consumption of Lead and Zinc ...	149
Mining Miscellany	151
Machinery and Equipment	152
Metals and Minerals	154
Mining Finance	156
Company Meetings	158
Professional Directory	160
Book Reviews	162
London Metal and Ore Prices ...	Cover iii

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Mining's Role in British Guiana's Development Programme

DR. C. B. JAGAN, leader of the British Guiana Government, and the Financial Secretary, Mr. Dandrade, have left for London to negotiate the purchase of the Demerara Electric Company, which supplies electricity to most rural areas, the Government's intention being to step up these services considerably. This concern has no connection with the Demerara Bauxite Company, a subsidiary of Alcan, whose outstanding achievements in the exploitation of the country's bauxite resources have been a major factor in the economic advancement of a territory which still remains largely underdeveloped.

In common with other Caribbean territories, British Guiana is still predominantly dependent on agriculture, and it is evident that in any attempt to broaden the basis of industrial and commercial activity the more expensive, as well as the more intensive, development of mineral resources must play a leading role. That the Government has a realistic appreciation of the benefits to be derived from a favourable climate for mining expansion was indicated very clearly at the Inter-Guiana Geological Conference held in Georgetown towards the end of last year, when Dr. Jagan emphasized that its policy was to encourage geological surveying to the utmost and to give special facilities to mining companies having sufficient capital and up-to-date scientific and technical resources to carry out large-scale exploration.

Mining's contribution to British Guiana's gross domestic production amounted in 1956 to 11.3 per cent, which compares with an aggregate contribution of 14.5 per cent from sugar and rice. The principal mineral products are bauxite, diamonds and gold. Last year the Colony produced about 1,750,000 tons of bauxite, 60,691 ct. of diamonds, and 3,448 oz. of gold. For the first quarter of 1960 the corresponding figures were 547,079 tons, 20,192.62 ct. and 655 oz.

Mr. J. N. Fraser, manager of Demerara Bauxite, has stated that, failing any abnormal increase in demand, no spectacular growth in bauxite production is to be expected in the foreseeable future. There has been a considerable influx of new capital, however, part of which has been devoted to the development of new methods and techniques, thus enabling the industry to remain highly competitive. The mining companies continue to maintain active prospecting programmes.

The gold industry suffered a severe blow in 1958 when British Guiana Consolidated Goldfields Ltd. ceased its large-scale dredging operations in the Potaro area. In a recent summary of progress, however, the Director of the Geological Survey Department of British Guiana expresses the hope that a revived prospecting campaign will lead to the development of new areas for large-scale dredging or hydraulicking. (*Overseas Geology and Mineral Resources*, Vol. 8, 1.) The Department plans to draw up a map of areas where future gold production could be carried out.

The output of gold and diamonds from small workings has been diminishing during recent years. The same report states that a survey of all the alluvial areas has been begun, including a study of the gold deposits of the Mahdia area and the gold and diamond diggings of the Middle Mazaruni River valley. On the recommendation of the investigator, old trails will be cleared and new ones opened in an attempt to encourage further prospecting by small operators. The main potential of the diamond industry, however, would appear to lie in the large-scale mechanized exploitation of the terrace deposits, as indicated by E. R. Pollard, C. G. Dixon and R. A. Dujardin in their study of the Colony's diamond resources, published in 1958 in the Geological Survey Department's Bulletin No. 28. A renewed impetus to production has been given by the new strike of alluvial diamonds made in 1958 on the upper Kurupung River, above Kumerau Falls, intensified activities in this area being responsible for the higher level of output in the first quarter of the present year.

Among the most important mining developments in British Guiana is the entirely new venture launched by the North West Guiana Mining Co., a subsidiary of the Union Carbide Corporation, which will result in the establishment of a new community in the North West District and will make a significant contribution to the development of that part of the interior. The company plans to start production of manganese ore this year at an annual rate of about 300,000 tons and hopes to make its first shipment before the end of the year. The ore will be transported to Trinidad by self-propelled barges for shipment to the United States.

The Colony's mineral potential has been further increased by a recent discovery of thorium-bearing ore in the Rupunumi district some 300 miles from the coast, made by the Geological Survey Department when carrying out exploration for uranium and thorium in co-operation with the Atomic Energy Division of the Geological Survey of Great Britain. In the coastal area, a concession to seek oil has been taken up by Standard Oil, which has already carried out seismographic investigations. It remains to be seen whether other minerals of economic significance will come to light.

At last year's Geological Conference Dr. Jagan stated that new capital invested in mining had jumped from $3,700,000 B.W.I. in 1956 to $22,000,000 in 1958. He expressed some regret, however, that investments were still being devoted to mineral extraction and processing to a semi-finished stage. Obviously the Government would welcome the establishment of local smelters, a possibility which has been brought a stage nearer by the construction of an alumina plant at Mackenzie with an annual production capacity of nearly 250,000 tons.

A national development plan for the years 1960-1964 inclusive was recently announced. Of the total of $110,500,000 B.W.I. to be invested in the plan, some $2,000,000 will be spent on geological surveys and a further $800,000 on cartography. Sums of $13,000,000 will be expended on industrial development and $8,530,000 on transportation and harbour facilities.

This programme has already received the approval of the British Government, together with the promise of considerable financial assistance in carrying it out. It is well known, however, that Dr. Jagan is anxious to increase the scope and tempo of the plan, and his determination is indicated by the projected purchase of the Demerara Electric Co., whose value is probably between £1,000,000 and £2,000,000. The money, however, has still to be found. While in London Dr. Jagan will doubtless take the opportunity of discussing further assistance from the Colonial Office. It would be foolish, however, for British Guiana to assume a capital burden which she was unable to sustain. In the opinion of experts who have made detailed studies of British Guiana's economy, the present development plan, as officially approved, would appear to be quite ambitious enough for the country's available resources at the present time.

GO-AHEAD FOR ALGERIAN FERROUS PLANT

After many months of negotiations between the French Government and ferrous metals interests, a settlement has at last been reached on the establishment of an important ferrous metals industry at Bône, on the Mediterranean coast of Algeria. An operating company, Société Bônoise de Sidérurgie, is to be formed, some 20 per cent of whose shares will be held by the ore producer Société de l'Ouenza. This latter concern will supply the new plant with iron ore from mines situated some 113 miles south of Bône. At present the complete output of Ouenza is exported. Now the company will be able not only to maintain its sales but also to begin with the exploitation of ores of lower iron content for supply to Bône. The ores are hoped to be concentrated with the use of natural gas, and experiments in this field have been carried out for some long time in preparation by French interests. The final form which the Bône works will take depends to a great extent on the final results of these experiments.

The new company is to have a share capital of 140,000,000 New Francs, to be held by Ouenza (20 per cent), some 32 leading French steel concerns (a total of 51 per cent) and various French and Algerian banking and finance houses under the leadership of the Banque de Paris et des Pays-Bas (29 per cent). In addition to the capital, the French State is to make available a non-repayable subsidy of 200,000,000 New Francs and a repayable sum of 40,000,000 New Francs, both these payments to be spent on the equipping of the new plant. The company is also to take up sums from elsewhere in the shape of capital credit. Initial investments, totalling 100,000,000 New Francs, are to be undertaken immediately.

It is estimated that the first stage of metal production will be completed by the end of 1962. Nevertheless, no decision has yet been reached on what kind of furnace should be used for production and on whether coal, oil or natural gas should be used to power the plant. Nor has any date been fixed for the erection of further stages of the installation, including building a rolling mill, though it is believed the whole project will take at least four years from the start of construction work.

TRAINING TECHNICAL STAFF FOR RUSSIA'S MINERAL INDUSTRIES

The loss of lives and a decreased birth rate during World War II cost the Soviet Union a potential labour force of 15,000,000. The full impact of this deficit will be thrust upon industry in 1959-65. Since the Soviet birth rate has not reached its pre-war level, the shortage is likely to continue in less acute form throughout the 1960's. The Soviets have attempted to cushion this crisis by transferring emphasis from labour to technology.

Because it underlines the changing emphasis from labour to technology, the education programme has undergone numerous alterations since the war. With the labour shortage at its peak in this period of transition, the Soviets must combat the dual problem of maintaining an adequate supply of manpower to alleviate the shortage and preparing technological cadres for the future. To implement the programme, the Soviets have pressured their youth into industrial occupations while encouraging the pursuit of academic studies via extension courses in part-time evening or correspondence schools. Under this new programme, 2,000,000 to 3,500,000 adolescents will be brought into industry yearly. The methods

adopted are the subject of a recent report by Bernadette C. Michalski, commodity research assistant, Division of Foreign Activities, Bureau of Mines, Washington, which has been issued as Bureau of Mines *Information Circular* 7949.

Recognizing that the advancement of Soviet industry is strongly dependent on the technological education programme, states Michalski, the Soviets have planned the education programmes as carefully as they have planned industrial development. To support industrial advances, the Soviet student is encouraged to enter the technological and science field as early as the elementary school level, where emphasis is placed upon the general sciences and workshop practice.

The same continued emphasis upon the sciences is found in the trade schools, universities, and institutes, where technicians and engineers get favoured treatment both financially and academically. All training is highly specialized. Only in the U.S.S.R. is such training possible, for it requires central planning not only as to education but also as to industrial and other economically dependent units. Because all training and research is centrally planned, there is little room for individual initiative and personal research projects. The trained engineer must serve in the capacity and at the location most useful to the national economy. Thus the Soviet student is offered free training in exchange for the subordination of personal initiative, desires, and comforts. Job assignments are centrally controlled, offering the Soviet Union an opportunity to shift manpower to the underdeveloped eastern regions with relative ease.

Unlike the U.S. worker, whose job mobility is high, the Soviet labourer, technician, or engineer is frozen in the job. No amount of experience on the job will qualify a Soviet labourer for a position as mine or plant supervisor. This position can only be filled by the man trained for the job in a Labour Reserve school or its equivalent in the new system. Engineering-technician positions are filled only by graduates of technicums, and advancement depends upon continued academic study and research.

As material rewards are considerably higher in the fields of advanced technology, most industrious students should not be deterred by the temporary delays.

POTENTIALS OF AUSTRALIAN COAL

Despite the inroads of oil fuel, and the development of hydro-electric power in New South Wales and Victoria, the coal potentialities of Australia continue to be a factor of great importance in future economy, weighed against the rapid growth of secondary industries in all States. In New South Wales, indicated reserves are 5,000,000,000 tons of black coal; in Queensland, 500,000,000 tons; in Western Australia, 200,000,000 tons; Tasmania, 120,000,000 tons and less than 100,000,000 tons in South Australia.

Despite competitive sources of power, the consumption of black coal continues to rise and an overseas export market is being built up. Black coal production totals 20,000,000 tons per year, and output of brown coal in Victoria is now 12,000,000 tons, the greater proportion of which goes into generation of electric power. Victorian brown coal reserves are estimated at 50,000,000,000 tons and research is active to promote the wider use of this fuel. The black coal industry, however, has made a remarkable recovery in recent years, resulting from reorganization, and improved efficiency, the wide adoption of mechanization, increased production of coal per man-shift and reduction in labour employed, the result being substantial reduction in production costs.

These changes have called for heavy capital expenditure. In the six years to June, 1959, expenditure on re-equipment amounted to £A32,200,000, of which £9,700,000 was spent on mining equipment and £7,400,000 on transport. Coal washing plants in this period cost £A3,500,000. Resulting from this, the cost of coal f.o.r. colliery has been reduced to 55s. 6d. per ton, or 12½ per cent in seven years. In fully mechanized mines output per man-shift has risen to 6.11 tons and the average for the industry has risen from 2.97 tons to 4.65 tons. Partially mechanized mines are not so favourably placed in the cost scale, and it is considered that in about 10 years' time, collieries with costs exceeding 50s. per ton will be unable to compete on the market.

The general trend is shown by the reduction in underground mines from 140 to 102 by the closure of unpaying, or marginal mines. In 67 mines all coal is machine loaded and of these, 48 have modern haulage compared with 25 eight years ago. Highly mechanized mines produce 81 per cent of all coal won. With increase in mechanical mining, demand for washed coal has increased, and there are now 30 coal washeries on New South Wales collieries, while there is a growing swing to the grading of coal to suit the requirements of users. The reorganization has meant displacement of labour in the industry, and the number employed on the coalfields has decreased from 20,000 in 1952 to a present figure of about 13,000. A very large percentage of the displaced labour has been re-employed in other industry, so that there is little unemployment on the coalfields.

In the period covered by this reduction in labour, output has increased from 14,300,000 tons to 15,800,000 tons an increase of 17 per cent, while employment in production fell by 30 per cent. Prominent in this great change are the continuous miner, shuttle cars, large capacity skips, with, to a lesser extent, diesel locomotive haulage in main roadways, and an increasing use of conveyor belts. The export market, defunct for many years by reason of high cost of coal, is now approaching 1,000,000 tons per year; within the State industrial demand for coal is growing, and large electric generating stations are being erected on the coalfields, ensuring a large, continuous demand for coal and obviating transport charges.

Improvement in port facilities for export trade has been urged for some time, and, belatedly, the government has recognized the handicap present inefficient facilities impose on the coal trade. The New South Wales Government plans to spend a probable £A6,000,000 in modernizing port facilities to ensure a competitive export trade and no time is to be lost in carrying out the work.

WAR ON OVERTIME IN HUNGARY'S MINES

Further restriction of overtime working has been imposed on managements of coal mines in Hungary. The intention, says the newspaper *Népszava*, is to protect the workers' rest periods. The war on overtime in the Hungarian pits has been going on for several years and has already resulted in substantial reduction of excess hours. In the first quarter of this year, for example, only 3.1 in 100 shifts were overtime shifts, representing an average of about 1½ hours per week overtime per worker.

Nevertheless a recent investigation has shown that a few workers were doing 4 or 5 and even 7 to 8 " overshifts " per month. Instructions have now been given to managements that in future no worker may work more than one overtime shift per month. Sunday shift working, with the exception of the one day a month permitted and paid for, must be compensated for by equivalent time off in the week. Coal production in Hungary in the first half of 1960 exceeded that planned by 188,000 tons, the Ministry of Heavy Industry has announced in Budapest.

Gold in Mosquitia

THE source of the great treasures of the ancient Aztecs and Mayans, as well as the fabulous amounts of gold that made the Spanish Main famous after the discovery of America, has been the subject of much speculation. The exact location of most of these "lost mines" is still unknown.

The Mosquitia Coast of Honduras is undoubtedly one of the least known areas of the world today. The rough terrain and thick jungle vegetation, the total lack of police protection and transportation, discourage all activity.

The Indian women still pan gold along the stream banks in their crude wooden bowls or bateas. They seldom wash over 15 or 20 bateas of sand a day, approximately one-fifth of a cu. yd. Blackiston reports that today approximately $125,000 worth of gold a year is still being produced by the women. At this rate, approximately $50,000,000 would have been recovered by the Indian women since the conquest, irrespective of the more extensive operations of the Spanish. Nuggets up to 100 oz. in size have been reported. Values up to $5 per batea have been reported in the Middle Patuca River area, the centre of the investigations covered in this report. The gold rivers are thus only periodically worked crudely.

There are no authentic figures on the gold reserves in Honduras and Central America. However, in 1952, Honduras produced approximately 32,000 oz. of gold and it is assumed that approximately this figure is still being produced annually.

The principal purpose of the investigations culminating in this report was to penetrate potential gold areas heretofore unvisited and to traverse the Mosquitia Coast jungles from one end to the other. Since the route followed by the investigators traversed areas never before visited, or at least never scientifically examined and reported, a scientific sampling programme of mass grade of ore was made. The work is purely a reconnaissance in nature but is detailed enough to substantiate some scientific conclusions. The studies were aimed at ascertaining the possible large scale production potential of the areas visited.

Engineering and Economic Problems

Some $20,000 worth of expedition and scientific equipment was imported from the United States. The expedition was made up of 16 men who accompanied it on various stages of the journey. The equipment was transported overland to the navigable rivers via mule-back and packs; thence the expedition moved via collapsible boats and rafts and two 40 ft. dugout Indian canoes. The total cost of the entire undertaking was approximately $50,000.

Most of the testing programme involved sampling the river gravel for placer gold values. However, still with a view to large scale production, localized high grade spots were ignored. In contrast, an attempt was made to evaluate the grade of the river bars in their entirety by averaging both the high and low grade values. The rivers Cuyamel, Blanco, Uluhuas and the Middle Patuca were sampled meticulously to ascertain the values of the entire mass of exposed gravels The river routes offer the major means of penetrating the area.

The stream channels containing the placer deposits in the upper mountainous areas meander somewhat, but for the most part are swift, deep and fast flowing, containing many rapids and a few shallow falls.

The ruggedness of the terrain, the physical conditions and the area's isolation, present many engineering and economic problems which must be overcome before any commercial operation could become profitable. The considerations referred to can be itemized as follows:

A. The highest grade of ore encountered is deep within the interior and is totally lacking of any means of transportation. In the author's opinion, equipment and supplies could not economically be moved overland from Catacamas by the route followed by the expedition. Neither could they come down the Patuca from the vicinity of Catacamas. This leaves only two alternatives for getting in the required equipment necessary for large scale production, namely, up the Patuca from the sea, or secondly, by air. The lower Patuca is probably navigable by shallow draft floating equipment. Supplies and equipment could be moved to near the productive area approximately in the vicinity of the Rio Huasprasni junction with the Patuca. Above this point, the river is thought to be unnavigable for large boats and equipment brought to this point would have to be dismantled and moved by shallow craft up to the productive area.

B. The living and working conditions would be severe and the heavy rainfall and tropical heat would severely handicap operations. These environmental factors would necessitate the construction of good, permanent insect- and vermin-proof living facilities where dry and sanitary conditions could be maintained.

C. The potential production area is close to the disputed Nicaraguan border and is an area totally void of any policing or even patrol activity by the government. The entire Mosquitia Coast is thus inhabited by many bandits and refugees from justice.

The area is sparsely populated by Zambu and Mosquitia Indians. These natives could be classed as only semi-civilized, but are friendly (even though timid) and are available for mine labour at wage rates ranging from $1 to a maximum of $2.50 per day. Other mine labour could be imported from the villages on the edge of the jungles at approximately the same rate. However, the low labour costs would probably be partially offset by high overhead costs inevitable to U.S. mining interests operating in any foreign country.

The natural resources of Honduras are apparently inviting to foreign investment. All the factors concerning the tax structure on mining production in the Republic of Honduras have not been ascertained by the author, but taxes do not appear prohibitive. In fact, the author understands that the Honduran Government has a policy of keeping the taxes low in order to encourage investment in her natural resources. Likewise, the duties on machinery and supplies imported are not prohibitive and are apparently negotiable free (libra entrada) for companies contemplating a sizeable investment.

As evidenced by the author's experience in Honduras within the last year, the Honduran Government's co-operation and help are outstanding. Their continued help for future ventures can probably be counted upon. Honduras has a modern mining code which apparently offers a

The following article is condensed from a geological and engineering report on certain sections of the Mosquitia Coast jungles, Department of Olancho, Republic of Honduras, Central America, by S. M. Glassmire, of S. M. Glassmire and Associates, geologists and engineers, Santa Fe, New Mexico. It is believed to be the first attempt scientifically to sample and appraise the area's economic potential

reasonable amount of security to investments. Her mining code has been laid down in Decree No. 64 by the National Congress.

No vein mineralization was observed extensive enough to be considered as a possible large operation.

When the upper Rio Cuyamel was encountered, the placer gravels were sampled. Sampling periodically continued on down the Rio Cuyamel. Some minor amounts of fine placer gold was encountered, but the overall grade of all ore above the Cuyamel's junction with the Rio Blanco appeared to be far too low for commercial operations. Even if any higher grade material was encountered, the total size of the bars and placer deposits in this strip of the river is insufficient for any but very small scale operations.

An increase in gold values was noted at the Cuyamel's junction with the Rio Perlas indicating a possible increase in values coming down from this tributary. However, the values appeared too low to warrant exploration up the Perlas and therefore this was not further considered.

Placer gold values of real interest were first encountered at the Cuyamel's junction with the Blanco. Values persisted up the Rio Blanco and Rio Ulahuas, on down the lower Cuyamel to the Patuca and on down the Patuca to the point known as the Valencia. Hence detailed sampling of the visible bars was conducted in these areas.

The country rock in this area consists of a black igneous rock which can best be described as a hard massive schist. The country rock is probably Pre-Cambrian in age and contains very many small quartz and liminite veins or veinlets. Most of these veinlets are less than an inch to 2 or 3 inches in width and seldom over a foot. These quartz veinlets were sampled in several locations throughout the Cuyamel, Blanco and middle Patuca areas and were found to contain gold and are thus believed to be the source of the placer gold encountered in the rivers. The veinlets are all insufficient in size to warrant a lode operation and, therefore, the author must conclude that the possibility of any lode mining is very remote. The placer gold values appear to decrease to well below commercial grade below the point on the Patuca known as Valencia and continue to decline on down the Patuca to the sea. No commercial minerals save gold were found in sufficient quantity to warrant study.

Techniques and Procedure

As indicated elsewhere in this report, the author was visualizing possible large scale production of the placer bars by working *all* the gravels contained in the bars and thus he attempted to ascertain the average grade of all the gravels contained in each bar including overburden if any. In all 21 locations detailed samples were taken. Only the visible bars were considered and the so-called bench placers, even though they exist, were ignored, not sampled and not calculated into total gravel quantities mentioned further in this report.

Each visible bar was sampled at various points so as to make the sampling representative. The entire thickness of the bars was sampled from the surface down to near bedrock in most instances. The 21 samples represent a total of 135,400 cu. ins. of gravel or an average of about 7,000 cu. ins. per each sample. Each sample, representing approximately 7,000 cu. ins. of gravel, was concentrated in bateas (native gold pans). The exact volume of each batea was known and thus the exact volume of each sample was calculated by knowing the number of bateas of gravel taken at each sampling position. The concentrates of each of the samples were saved and assayed chemically for gold values and the values thus reduced to total values per yard since the exact volume represented by each sample concentrate was known.

The value of each bar is tabulated on the following chart. Item No. 3 on the table represents the range of values that were found at different places and different depths of the bars. They were estimated visually by counting the number of colours and not by chemical analysis. The colour count method of estimating values involves counting the number of colours per known volume, and estimating the values of each colour according to its size as follows :

Medium gold—minus 1/32 in. approximate value of 1½ c.

Fine gold—minus 1/64 in. approximate value of 1/3 c.

1 *Volume of Concentrate Assayed* (*In.*)	*2* *Volume of Original Gravel* (*Cu. In.*)	*3* *Value Range Mine Run Gravel* (*$ per Cu. Yd.*)	*4* *Value per Ton on Concentrate* (*Oz. of Gold*)	*5* *Value per Cu. Yd. of Mine Run* ($)
8.72	7900	0 – 3.00	1.90	0.11
8.66	5900	0 – 0.75	0.32	0.025
10.38	7260	0 –30.00	16.42	1.23
4.76	4600	0 – 3.00	1.26	0.069
6.10	7260	0 – 2.50	3.79	0.167
10.31	6600	0 – 1.00	0.55	0.045
28.04	6600	0 – 1.00	0.67	0.15
14.68	5900	0 – 1.00	0.57	0.075
1.342	4000	0 – 3.00	3.54	0.063
10.55	5300	0 – 2.00	3.26	0.341
13.90	6600	0 – 3.00	6.78	0.75
15.18	7260	0 – 6.00	9.74	1.07
9.76	7260	0 –30.00	36.02	2.54
12.32	9440	0 – 3.50	7.78	0.534
9.40	8580	0 – 1.50	4.92	0.283
1.71	2640	0 – 2.00	13.26	0.452
3.23	3960	0 – 2.00	6.70	0.286
11.17	6600	0 – 1.50	8.21	0.729
5.67	4600	0 – 1.50	6.65	0.43
8.72	9240	0 – 5.00	10.62	0.526
11.10	7900	0 – 6.00	18.07	1.33

All gold values shown on the chart are calculated with gold being worth $35 per ounce. Boulders larger than 4 in. in dia. were counted in the total yardages in order to make the values per yard as shown realistic of what might be expected in mining the deposits. All concentrates were examined megascopically for other minerals and the concentrates from three representative bars were assayed spectographically for the possible presence of other commercial elements.

Economic Conclusions Indicated

In evaluating the sampling evidence the following conclusions are apparent :

(a) The fabulous gold concentrations of stories and legends do exist in certain locations. However, these river gravels are general and the high grade values are spotty and their occurrences are unpredictable. Any operation aimed at high grade rich bonanza material is hazardous and can only be referred to as speculative.

(b) However, many of the bars examined contain total mine run values which would enable them to be worked as a whole. Total mine run values in excess of 25 c. a yd. are presumed to be commercial. This is an opinionated statement, but it is believed to be one with which most experts would concur even though it is conservative. Therefore, referring to the assay tabulations, the bars running in excess of 25 c. per yd. can economically be worked as a whole. Those bars containing values less than 25 c. per yd. would probably have to be stripped and otherwise highgraded to be worked at a profit.

(c) It is further evident from the sampling techniques and the results of the assays that these placer gravels can be easily concentrated by simple gravity and washing separation methods to get a high value concentrate. The cost of such concentration, of about 10 c. a yard, would be a logical expectation.

(d) From sampling the bars, it was evident that the gold values increased with depth with the highest values being found on or close to bedrock. This is typical of most placer deposits.

(e) The fineness of the gold is not accurately known, but from all indications a product of 900 fine or better could be expected.

(f) The size of the gold colours varies, but most are in the medium-size class (minus 1/32 in.). Very few large nuggets were encountered and the amount of fine or very fine colours appears to be negligible.

(g) The exact procedure and techniques that might be used to produce the properties was beyond the scope of this preliminary investigation. However, it can be said that no factors are apparent that would be prohibitive to mass production.

Reserves or Quantity of Material

Ten bars were sampled in Patuca area from the Cuyamel junction to a point below Valencia, and the average value of the total yardage in each bar is 81 c. per cu. yd. The average size of each bar is estimated to be 300 ft. wide x 1,200 ft. long x 6 ft. in thickness. This gives a minimum of 80,000 cu. yds. exposed in each bar. Ten bars were sampled for a total yardage in all ten bars of 800,000 cu. yds. Only every third bar in this stretch of the river was sampled. It is assumed that the two bars in between the sampled ones would average the same values.

This would boost the total yardage in sight in all the bars in this stretch of the river to 2,400,000 cu. yds. Since this amount of gravel is in sight in visible bars and is measured and sampled, it could be classed as proven reserves. As indicated elsewhere in this report, only the visible bars were taken into consideration. The old stream channels and the bench placers as previously described were not considered since, for the most part, they are covered with vegetation and shallow underburden and are not readily accessible to reconnaissance examination. However, these old channel gravels and bench placers could possibly increase the available yardage ten times the above yardage which is visible (probable reserves). At average values of 81 c. per yd., the gross evaluation is apparent.

Another 1,000,000 tons of gravel is estimated to exist in the Rio Blanco-Ulahuas area. Many of these bars run below 25 c. a yd., but all contain high grade materials at some positions. Therefore, some highgrading techniques are assumed to be necessary as evidenced by the sampling. The Blanco-Ulahuas area, therefore, should be worked as a smaller scale subsidiary operation to the Patuca area. It should be obvious that only a very small proportion of the Mosquitia region was examined. There are good possibilities of other areas besides those studied being of commercial value.

FINNISH MINERAL PROJECTS

PROFESSOR EINO SARRI has forecast that by 1969-70 Finland's metals industry will have an output worth Finnmarks 152,000,000,000 compared with 71,000,000,000 in the period 1959-1960, and will be employing 133,000 workers compared with a present figure of 99,000. The Finnish metals industry produces 15 per cent more in value than the country's wood and paper industry, and in ten years' time it is estimated that this figure will have risen to 50 per cent.

Indeed, important extensions to Finland's capacity are reported from Helsinki, particularly noteworthy being expansion of production and of exploitation potential by the State mining concern Outokumpu Oy. This concern, which was last year granted a loan of some 3,800,000,000 Finnmarks by the Reconstruction Credit Institute of Frankfurt-on-Main for the exploitation of the Pyhäsalmi ore deposits, now announces that when work on this site is completed an annual output of 600,000 tonnes of ore will be produced there. This compares with a total national ore production last year of rather under 3,000,000 tonnes.

Work on the erection of mining and crushing plant has now been going on in the Pyhäsalmi fields since late 1959. As well as sending up copper production by a considerable amount, the finished plant will permit the export by Finland of about 35,000 tonnes more zinc concentrates per year; total Finnish output of zinc concentrates last year was 98,000 tonnes. Also, some 350,000 tonnes of sulphur pyrites will be processed by Outokumpu annually, this in its turn resulting in the planned expansion of sulphuric acid production by the nationalized Rikkihappo sulphuric acid and superphosphate concern, based on the extra 100,000 tonnes of raw material annually which that firm will draw from the Outokumpu copper plant. This expansion on the part of Rikkihappo will be financed partly by a foreign loan of some 1,200,000,000 Finnmarks.

With the recent closing of two small ore mines and the opening, in Kotalahti, of a nickel mine, Outokumpu at present produces some 1,500,000 tonnes of mineral ores per year. For the future, the opening of a lead mine is planned and possibly the entry into iron ore exploitation in the Kolari district of Finnish Lapland. In this latter area, in the Far North, some 40,000,000 tonnes are believed to be deposited. A realization of the plan could, however, not take place within the next few years. Outokumpu, also a producer of precious metals — last year it produced 726.5 kg. of gold and 16,259 kg. of silver — realized in 1959 a total turnover of about 12,000,000,000 Finnmarks, or as much as 2,800,000,000 Finnmarks more than in the previous year.

Another important project for the Finnish mineral industry's future is the production as from 1961 of 300,000 tonnes of iron ore annually by the Jussarö mine owned by the private Vuoksenniska company. This concern has recently formed, with the Swedish Stora Kopparberg company, a joint subsidiary with the name of Oy Koverhar AB. As from the end of next year, it will produce pig iron on the basis of Finnish ore at the rate of 250,000 tonnes p.a.

The other main project at present on hand is the planning of a new ferrous metals plant by Rautaruukki Oy, a concern owned 75 per cent by the Finnish State and 25 per cent by a group of four private interests. First stage will be a blast furnace of 300,000 annual tonnes capacity, to be followed by a rolling mill.

Lead and Zinc—II

World Consumption of Lead and Zinc

This is the second of two extracts from a paper presented by R. Hendricks, executive vice-president, The Consolidated Mining and Smelting Co. of Canada Ltd., at a joint session of American Zinc Institute and Lead Industries Association, at St. Louis, United States, on April 7, 1960

IN the present discussion, references are to the Free World because we do not have reliable statistics from the Soviet *bloc*. However, metal from this area is appearing in Free World markets and we must keep these countries in mind and hope that in due course information from them will become available.

According to preliminary estimates, world consumption of both zinc and lead improved in 1959, reaching levels appreciably above those in 1958 and practically regaining the previous peaks in consumption reported in 1955. Had it not been for the steel strike in the United States, world consumption of zinc would certainly have been the highest on record. With further improvement forecast for both metals in 1960, the tide appears to have turned and world consumption of both metals to be moving upward again, though at a relatively slow rate unless we can achieve a break-through by new developments.

While the world picture is somewhat encouraging, that here in the United States is far otherwise. Although zinc consumption at 934,000 tons in 1959 was considerably above that in 1958, it was no higher than in 1957 and appreciably less than in a number of earlier years. Since it had been hoped that consumption would reach at least 1,000,000 tons in 1959, the actual achievement is certainly disappointing. It is true that one important reason was the steel strike, a factor beyond our control, and with this settled the Department of Commerce now suggests about 1,100,000 tons consumption in 1960. This would be an improvement but it would still not reach the level of 1955. We thus have to face the disturbing situation that while the general industrial activity of the United States is advancing, and while many other countries are increasing their consumption of zinc, here, in the world's important single market, ground is being lost. It is evident that we must continue to seek methods of increasing the consumption of zinc, recapturing, if possible, any uses that may have slipped away too easily, and strengthening present uses which may be threatened. In this connection the importance of maintaining a stable price that is competitive in all aspects with other materials cannot be stressed too often.

Having given you the dark side of things I should mention some bright spots. It is encouraging to see the increased demand for galvanized products. May I say that I foresee a tremendous potential for galvanized products if we can ensure the quality of material and actively encourage its use wherever properly applicable. The zinc die casting industry is a classic example of co-operation in action. The success which this industry has achieved in offsetting further inroads by new materials is noteworthy but, as I have already indicated, the job is not finished. It never will be. While the industries mentioned constitute the bulk of zinc slab consumption in the United States, we must not neglect the numerous small uses of zinc which make up the balance, for I think it is generally true that existing uses can be maintained and expanded with much less difficulty than is required to develop a new use.

Many of my remarks concerning zinc apply equally to lead. In 1959, the United States consumption of lead at 1,083,000 tons represented an increase of about 100,000 tons over 1958, but this was only a return to the same level as in 1943 and was still considerably below that in 1950. If we allow past conditions to continue we thus have no basis for expecting significant improvements in the future.

No doubt we can adduce various reasons which account for the declining use of lead, but in so doing we merely point out instances where competitive materials have taken over our markets. The situation challenges all of us to support an aggressive programme of research and development in order to protect the markets we have and develop new ones.

After these critical remarks regarding consumption in the United States, I must hasten to add that we are in little, if any, better situation in Canada. Zinc consumption at 68,000 tons in 1959, though higher than for several years, was well below that in 1942 and 1943. Even so, 1959 is considered to represent an inflated demand due to the steel strike in the United States. Galvanizing is the most encouraging specific use of zinc in Canada but die casting, brass and others are relatively disappointing. Primary lead consumption at about 45,000 tons in 1959 was below that in 1955. As elsewhere, decreases in the use of lead in cable sheathing and pigments were marked. Canada is thus another country which needs aggressive research.

Europe

Before I speak about the consumption of lead and zinc in Europe I should like to say a few words on the European Common Market (the Inner Six) and the European Free Trade Association (the Outer Seven).

It has been feared that the Inner Six might surround themselves with a high tariff barrier, making the area practically inaccessible to the rest of the world. However, the rates which have been announced by the Common Market have demonstrated a creditable spirit of co-operation. For lead and zinc metal, the tariff is to be 0.6 c. (U.S.) per pound, while ores, waste and scrap will be exempt. In addition, significant proportions of the metal imports of individual countries will also be exempt. As tariffs go these proposals must be considered reasonable and indicative of a willingness to trade with other countries in good faith.

It is expected that by the formation of the Common Market and Free Trade Association, living standards in the participating countries will be raised, thus creating a demand for consumer goods which otherwise would have taken many years to develop on an individual basis. Already the European market is undergoing a revolution that many of us on this side of the Atlantic may not fully appreciate. Incomes are rising and are being translated into higher living standards. Europe is in the midst of a break-through to mass car ownership such as took place in the United States in the 1920's. Present total vehicle population in the Common Market countries is 16,000,000 and by 1970 is expected to reach 38,000,000. This is only one example of a growing industry in which much lead and zinc is consumed. Similar growth is being shown in

the construction industry and there is a great increase in demand for all types of appliances. All of this augurs well for the future consumption of raw materials.

The total consumption of zinc in Europe has shown almost uninterrupted growth since 1954, and since 1958 it has exceeded that in North America. Germany, France and the United Kingdom together account for almost 70 per cent of the European total and 30 per cent of the world total. One of the most promising uses for zinc in Europe is in galvanizing. There are now four continuous strip lines in the United Kingdom, all working at capacity, five in France, two in Belgium with a third under construction, and three in other countries. Galvanized sheet is being used in some automobiles and galvanized structural steel is finding continuously wider use for buildings and other purposes. Zinc spraying is also making good progress with more than 1,000 tons expected to be used on the new Forth Bridge in Scotland. Zinc die casting in Europe has never experienced the same growth as in the United States. On the other hand, in spite of much dissatisfaction with plated products there was not a marked trend away from them. The average British car now uses about 50 lb. of die casting and with the results of recent research available, it is felt that this application is secure for the present. On the Continent, however, much less zinc is used in cars, and it has been reported that in France automobile manufacturers are turning to plastics because of what they term the present high cost of zinc.

In Europe the decline in lead consumption during the last few years now appears to have been wiped out and the estimated 1959 total is up to that for 1955.

Australasia and the East

Turning to Australia and New Zealand, zinc consumption has generally been better maintained in recent years than in many other countries, and preliminary estimates are that 1959 consumption will about equal the former peak of 1957. As elsewhere, galvanizing is of major importance but die casting is also showing good growth. Lead consumption, on the other hand, has not been doing so well and in 1959 was apparently less than in any year since 1954. This is in spite of the fact that in these countries lead still has an important place in the cable sheathing industry. One remarkable point about Australia and New Zealand is the high *per capita* consumption of both lead and zinc. In this respect they are well above the United States and far ahead of Canada, a country of roughly comparable population.

Let us now take a quick look at Asia where Japan is the outstanding country as far as our present interests are concerned. As a result of aid from the United States, coupled with vigorous local activity, the economy has shown remarkable recovery and continuing growth. In zinc consumption there has been uninterrupted increase for at least 8 years. The consumption for 1959 is estimated to be close to 170,000 tons, nearly 2½ times that in 1951. A number of continuous galvanizing lines are now in operation in Japan and in 1958 the zinc consumption in galvanized sheet alone was over 76,000 tons. This may be compared with less than 20,000 tons ten years previously. Die casting has also developed strongly and in 1958 accounted for 10,000 tons of zinc. With further growth expected in automobile manufacturing, the die casting industry should continue its progress. Lead consumption in Japan has not been so satisfactory. Although in 1959 consumption reached 75,000 tons, a 12 per cent increase over 1958, it was still more than 20 per cent below that in 1957. Again the main loss was in cable sheathing, although consumption in other uses also declined. It may be expected that the growing automobile industry will strengthen the demand for lead.

India, where industrial development is only beginning, has considerable potential as a consumer of lead and zinc but a major difficulty is the very limited domestic ore supply and a chronic shortage of foreign currency for imports. The present consumption of zinc is about 65,000 tons per year, some 50 per cent of which is used in galvanizing. At least one of the new state-owned steel mills is expected to be doing galvanizing within a few months and the growing demand for consumer products should increase activity in zinc die casting. Official forecasts suggest about 170,000 tons annual consumption by 1970. In view of the currency difficulties, the government tends to favour aluminium since domestic raw materials are available for local production. Lead consumption, now about 22,000 tons per year, is expected to increase to about 55,000 tons per year by 1970. I suggest that India deserves our serious attention to see if there is not something more that the industry might do to promote lead and zinc usage.

Elsewhere in Asia there are some possibilities. For instance, in the Philippine Islands a galvanizing industry is developing that could consume 15,000 to 20,000 tons per year of zinc in the foreseeable future. It has also been reported that the Philippines will be making their own cars in the next three to five years.

Information on Communist China is sketchy and unreliable, but production of refined zinc in 1959 is indicated at 66,000 tons and at this level the supply is estimated to be slightly deficient. The production of refined lead in 1959 is indicated at a little over 80,000 tons. A slight deficiency of lead is also indicated.

South America and Africa

Consumption of lead and zinc in South American countries has not shown any startling growth in recent years. The consumption of zinc in 1959 is estimated at about 50,000 tons, up slightly over recent years, while lead at an estimated 70,000 tons in 1959 is also slightly higher than in recent years. These countries seem on the brink of further industrial development with the reported increase in automotive production, using locally manufactured parts wherever possible. This industry is being developed to reduce the drain on foriegn exchange.

It has been estimated that the present zinc consumption of Brazil, which is about 20,000 tons per year, will rise to 37,000 tons in 1960 with a further expansion to 51,000 tons expected by 1965. It has also been reported that a new plant for the production of die castings in Brazil is to be constructed. The current consumption of lead in Brazil is about 25,000 tons and is said to be on the increase as a result of the automobile industry. The consumption for 1960 is forecast at 40,000 tons.

Finally, let me say a word about Africa. Statistics of consumption are conflicting, some showing continued increase over a number of years and others a substantially static condition. However, they all agree in reporting that the consumption of lead and zinc is very low in relation to the population. Africa is awakening and will no doubt make rapid strides towards industrialization. The continent has abundant resources in lead and zinc and I believe has also a great potential as a consumer of these metals. At this time there may not be much that we can do directly to promote the use of our metals in Africa or in other parts of the world where much of the country is based on a traditional agricultural economy. However, we should be aware of these countries and on the alert for opportunities as they progress towards maturity.

MINING MISCELLANY

It is reported from Northern Rhodesia that closed circuit telvision is being tested as an aid to operators of the bucket wheel excavator which is being used to clear overburden in the open pits.

★

A ferro-manganese furnace with equipment worth about £500,000 has been ordered from the Norwegian concern Elektrokemisk A/S by Broken Hill Pty. of Australia for its new plant in Bell Bay, Tasmania.

★

The American Zinc, Lead and Smelting Co. plans to close down all units of its Monsanto, Ill., electrolytic division plant on July 22 for 10-14 days for major repairs. Mr. Howard I. Young, the company's president, said that between 325 and 350 employees will be affected, most of whom will take a holiday during the close down period. Casting operations of zinc alloy ingots, weighing 18,000 lb. each were started in late June at this plant. The ingots, made of "hydro-t-metal", which are being produced for Hydrometals Inc., measure 15 ft. in length, 41 in. wide and 10 in. deep, and are believed to be the largest ever to be cast for rolling purposes.

★

Barclays Bank D.C.O., report that an intensive search for minerals is to be undertaken in Uganda during the next few years, at an estimated cost of £216,000, £112,000 of which will be spent on aerial survey. £95,000 is to be provided by the U.N. Special Fund, the balance to come from Uganda. Other investigations are being made by two members of the U.K. Atomic Energy Authority, who are examining the beryl deposits in Kigezi and Ankole, Western Uganda.

★

It is reported from Malaya that all mines in the Linggi locality of the State of Johore, ordered to be closed in 1951 owing to terrorist activities in the area, have now resumed production. Iron mining operations have commenced on a relatively large scale at the Tuago Iron Mine, at Ma'Okil in Johore. At Semiling in Kedah, however, Warren Mining has ceased iron ore mining operations due to exhaustion of reserves.

★

Pravda reports the construction of an ore dressing plant for treating the Gai deposits in the Orenburg Steppe, as part of the seven-year plan for increasing copper output in the Urals. Most of the Gai copper pyrites will be mined by opencast methods where the ores are at a depth of between 230 to 260 ft. Nearly 10,500,000 cu. yds. of overburden have been removed since excavation started a year ago. The first plate of copper from the Gai ores has been sent to Moscow by the Mednogorsk Copper and Sulphur Mills.

★

The Development Loan Fund has granted credit totalling $U.S.400,000 to the Lebanese company Société pour l'Industries des Métaux in Beirut to aid the expansion of its aluminium output.

Two 977 Libu buckets on Caterpillar Traxcavators ldading simultaneously into Athey PR 21 dump truck at St. Patrick's Copper Mines, Avoca. The Libu bucket installation is described in our "Machinery and Equipment" section

Russian official sources report the founding of a research institute for the study of hydraulic transport methods for coal at Lugansk, in the Ukraine.

★

It is reported from Hungary that Mr. Janos Szalai, chief engineer of the Zagyvarona metal combine, has invented a one-stage process for the production of ferro-chrome from Hungarian ores, instead of using the conventional three-stage process, and trials of the new production method are being carried out at a pilot plant in the works. The same engineer is also reported to have worked out a process for obtaining nickel commercially from Hungarian ores.

★

Under an agreement between the Greek Fertilisers Co., and the West German Krupp concern, up to 4,500 tonnes of ferro-nickel annually is to be produced at the Larymna plant (see *The Mining Journal*, June 24, p. 740). The mineral is to be manufactured from indigenous iron ore with a lower nickel content by the process developed by the Greek professor Moussoulos. Pig-iron and raw steel are to be processed from the resultant slag and the plant will have an annual output of about 90,000 tonnes of raw steel. Production is expected to commence late 1961/62. Investments required are estimated at $U.S.5,000,000, half of which will be supplied by Krupp.

★

The Mexican Ministry for Raw Materials announces the discovery of valuable copper deposits near La Verde, in the Michoacán district. The reserves are reported to extend over 25 sq. km., and contain an estimated 5,000,000 tonnes.

A team of Japanese geologists has been examining the copper deposits in Kitcharao, Agusan province, Philippines, owned and operated by G. Y. Ornopia and Associates of Cebu City. The property is reported as having an ore reserve of about 18,040,000 tons, of about 1.17 per cent copper, with silver content from 1.80 oz. per ton, and gold 0.05 oz. per ton.

★

The Israeli Minister of Development has reported the initialling of an agreement with the America-Israel Phosphate Co., a subsidiary of the Albumina Co. of U.S.A., granting the company prospecting rights over three separate areas in the Negev to search for new phosphate fields. He also referred to the favourable report on the Dead Sea potash works submitted after the president of the World Bank's visit to Israel. Private American capital is expected to be interested. Present plans called for a two-stage expansion of the plant's capacity, some 400,000 tons of potash annually in the first stage, and 700,000 tons in the second.

★

The Jordanian Ministry of Trade reports important copper deposits located in the Aqaba area, and states that applications for exploitation are already being considered.

★

A report from Brazzaville states that a deposit of potash, said to be important, has been discovered some 30 miles east of Pointe-Noire, in the territory formerly known as French Congo, by the mining companies Société des Pétroles d'Afrique Equitoriale and Mines Dominiales d'Alsace. First borings have shown a 16 ft-thick layer of sylvanite with high potassium content, and exploitation is believed to be possible.

Machinery and Equipment

Diamond Impregnated Core Bits

As is well known, there are two different classes of diamond core bits on the market, namely the surface set and the impregnated diamond core bits.

In surface set bits the whole cutting and working capacity of the tool is located near the surface. As soon as the exposed diamonds have lost their cutting capacity, the bit must be withdrawn for resetting.

Impregnated bits, on the contrary, only expose a small part of their cutting elements, their diamond grains being carefully protected by the harness of the metal bond. These bits may be worked out almost entirely; the diamond particles of their impregnated crown only appearing gradually as the surface grains wear away or are torn out when others come into action. Normally this action goes on until the consumption of the impregnated part of the bit has been completed.

Diamonds used on surface set bits may have great differences in quality. This is not the case with the impregnated bits where the quality of the diamonds remains the same, namely Congo boart. This boart, composed of very irregular diamond crystals, is specially treated by crushing, sieving, classifying, re-crushing and epuration in order to obtain small but regular crystals of different grit sizes.

The quality of those diamonds incorporated in diamond boart tools achieves a uniform standard; this applies to all types of bits produced by diamond boart.

The diamonds sintered in D.B. impregnated bits range in sizes from 10 to 200 per carat. The different grit sizes are mixed with the metal powder of the matrix in different ratios according to the nature of the formations to be drilled. Some bits are impregnated with a great amount of large grits, others have a greater proportion of fine diamond particles. This explains why impregnated bits will maintain an important number of active cutting points until the whole impregnated crown has been consumed.

Diamond boart impregnated bits are made in several types according to the nature of the formations to be drilled. The carat weight of the diamond content of a definite bit may thus vary from type to type.

Since the manufacture of mechanical set diamond impregnated tools was begun in 1936, diamond workshops have accumulated great experience in the sintering of metals by powder metallurgy. During this period several hundred thousands of diamond tools have been manufactured and supplied for use throughout the world and an important number of metal bonds adapted to every particular set of working conditions have been developed.

For the coring and drilling bits three different matrices are used, namely: normal matrix or L-bond (Rockwell C Hardness 40 to 42), hard matrix or N-bond (Rockwell C Hardness 53 to 57), and special matrix or U-bond (Rockwell C Hardness 50 but very abrasive resistant).

Apart from these metals, diamond boart has also played a role in the development of tungsten carbide inserts of different shapes, impregnated with diamond particles and having a Rockwell C Hardness of 81. These inserts are brazed into the bit, or reamer blanks, and are extremely wear-resistant. Bits of this type are specially indicated for drilling in highly abrasive formations and weathered zones. They allow operations with strong bit pressures to be completed.

DROP BOTTOM SHUTTLE CAR

The latest mining equipment by Kersey Manufacturing Co., Inc., U.S., a drop bottom shuttle car, designated Model SC-3D, is a 2½-ton capacity unit, only 26 in. high, and designed for mining low coal with hauls up to 500 ft. The SC-3D is entirely powered by battery.

This car can be driven by one man, and is motivated by low voltage motor and gear reduction to the drive wheels. It is fitted with drop bottom, has self-reclosing doors and automatic operation for discharging the load in pit or bin, all of which can be operated by the driver.

The unit is one of the wide range of mining equipments manufactured by Kersey.

PHOTOGRAPHY AIDS BLASTING RESEARCH

A high-speed motion picture camera and other photographic equipment being used by U.S. Bureau of Mines scientists to gain a clearer understanding of what happens when rock is shattered by explosives is described in a new publication released recently. By exposing supersensitive film at speeds up to 3,200 frames per sec., the camera can faithfully record blasting phenomena that occur in fractions of a second. The film, when developed and projected at normal speed, becomes a slow motion picture, enabling viewers to study closely the split second reactions that took place during blasting.

High speed photography has provided Bureau researchers with valuable information over the past few years. For example, it has shown how rock is moved by the blast, how the stemming used to confine an explosive charge may either resist, or be dislodged by, the

The new Kersey drop bottom shuttle car, Model SC-3D

force of an explosion, and how detonation gases escape through broken rock. Such knowledge helps in identifying poor blasting practices and in developing improved techniques.

The report was written by B. E. Blair of the Bureau's Applied Physics Laboratory, College Park, Md. It contains detailed descriptions, including illustrations, of the photographic equipment employed in blasting studies and gives step-by-step instructions on how the equipment is used to assure accurate results. A copy of Report of Investigations 5584, *Use of High-Speed Camera in Blasting Studies*, can be obtained from the U.S. Bureau of Mines, Publications-Distribution Section, 4800 Forbes Avenue, Pittsburgh 13, Pa.

A RANGE OF BELTS

To meet the increasing world-wide demand for high tensile conveyor belting, BTR Industries Ltd., has announced a comprehensive range of man-made fibre belts with safe working stresses ranging from 40 lb. per in. per ply up to 200 lb. per in. per ply. Called NYPAC, this new range of belts are nylon wefted and combined with either cotton, rayon or terylene, according to the tensile strength.

The main advantages of NYPAC over conventional cotton belts are: higher safe working stress values, better impact resistance, lighter in weight, greater flexibility, better troughing characteristics, greater resistance to longitudinal tearing, higher pullout strength, and as a result of greater flexibility smaller drum diameters than advocated in BSS2890 may be used. Apart from these advantages BTR terylene nylon belts are particularly suitable where acid or chemical contamination is likely.

The NYPAC range is available in three qualities of rubber cover: 4,000 lb., 3,500 lb. and 2,500 lb. These are equivalent to covers on BTR Super Longlife, Longlife and Consort Belting, and are branded NYPAC 4,000, NYPAC 3,500 and NYPAC 2,500 respectively.

NEW SIDE TIPPING BUCKET

A world patented invention, the Libu three way bucket is claimed not only to substantially boost loader capacity and cut loading costs generally, but also to make it possible to employ mechanical loading in spaces so confined that conventional loaders cannot find practical application through lack of elbow room. The bucket differs from the conventional loaders, in that it can be tilted as desired out to the right or left, as well as forward. The side tipping function is based on the principle of the open sided bucket swivelling about a centre pivot. It can be such that the bucket is a giant mechanized version of the age old hand spade which is also open sided, rotated by the hand above the handle.

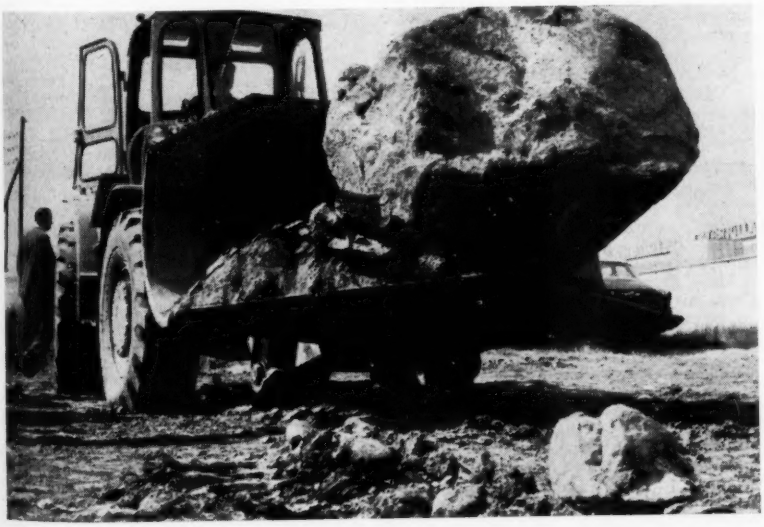
If its loading be properly organized, the distance the tractor travels will be only 2 or 3 yds.; this reduces drastically driving and turning, which produces valuable shortening of cycle time. The capacity increases per hour and 20 per cent to 60 per cent over performance possible with the conventional type bucket will result. Savings to wear of tracks and wheels as well as in fuel consumption and engine fatigue, will add to the cost cuts made possible through the capacity increase.

The space required for the loading operations will in theory be restricted to the combined width of the loader and the conveyance. In practice, an addition of 10 per cent to this dimension is sufficient for loading operations to take place and means that the Libu equipment Traxcavator will only need ½ to ⅔ of the space required by the same size tractor loader with a standard bucket. This makes it possible to perform efficient loading operations in such confined spaces as development tunnels, the drawpoint of mine stopes, unloading of iron ore or concentrates from large tonnage cargo ships, etc., where power shovels and tractor loaders have hitherto been unable to operate in the dimensions now required by this new equipment.

The sideless manganese steel bucket is claimed to lift boulders and bulky loads much more easily than one of conventional shape, and its strong plough shaped cutting edge can be used for bulldozing. The new models now offered by the Libu Shovel Co. AB, Stocksund, Sweden and by its affiliated companies with the same name in Amersham, U.K., Sydney, Australia, and in New York and Los Angeles, U.S., are modified on a basis of the knowledge obtained. There are now various models of buckets available for light material as well as also heavy duty to cover the complete range of Caterpillar Traxcavators, both on crawlers and wheel types.

The new Libu models, which are easily interchangeable with standard Caterpillar buckets without any alteration to the Caterpillar framework, are claimed to have increased side dump clearance, heights and movability. The new built in and guarded side dump cylinder commits a maximum unloading height of 130 in. for the 977, 119 in. for the 955 and 944A and 102 in. for the 933. All buckets are equipped with a hydraulic safety valve. (See also page 151.)

The Libu three-way dump bucket for Caterpillar 944 wheel loader



ENGINEERING BROCHURE

Head Wrightson Minerals Engineering have prepared a brochure showing some of their many activities in the field of coal preparation and the processes and equipment they have available for dealing with the problems arising in many different coalfields. Their coal preparation plant at Manvers Main Colliery, which has a nominal capacity of 1,320 t.p.h., is one of the largest in Europe.

Head Wrightson are licensed by Stamicarbon (a subsidiary of the Dutch State Mines) to use the Barvoys/D.S.M. Dense Medium Processes and also the cyclone washer.

In the Barvoys/D.S.M. group of processes suspensions of barytes, shale or magnetite can be used as the separating medium, and several forms of separating vessel are available. Accurate separations can be made at any specific gravity normally required in coal preparation. The processes are particularly suitable for use in preparation plants dealing with run-of-mine coal, and can be used to give a two- or three-product separation as required. Normally they are applied to coal sized between any desired maximum, and a minimum not below ½-in. (frequently 1 in.).

The cyclone washer is claimed to be the most advanced method of cleaning small coal available to the coal industry. The great accuracy of separation gives marked benefits in dealing with difficult coals with high middlings content; two-product separations at high densities, giving a higher recovery for the same ash than less accurate separation at lower densities, and three-product separations with a very wide range. Considerable experience has been obtained in the use of the cyclone washer for coal up to ½-in. in size, but it can be used to clean up to 1 in. when required. A cyclone washer was incorporated in the pilot plant designed to treat 30 t.p.h., built for the Fuel Research Institute of South Africa.

Fully automatic Baum boxes of established proprietary types have been incorporated in many of the plants which Head Wrightson have constructed for washing the smaller coal, notably those at Manvers Main and Primrose Hill.

Head Wrightson is also licensed by Staellberg-Stripa to use the Stripa process, which is substantially a dense medium process, but is able to use comparatively coarse medium solids which are cheap to prepare and simple to reclaim.

Metals and Minerals

Molybdenum in Adequate Supply

Free World demand for molybdenum during the current year was earlier expected to be in the region of some 30,000 to 35,000 s.tons, but it is evident that this estimate was made before the unexpectedly sharp downturn in U.S. steel production. Last year Free World production rose by 20 per cent to approximately 28,000 s.tons, and it has since been running at a substantially higher rate. Now that agreement has been reached by American Metal Climax and the union representing workers at the Climax mine, supplies would appear to be reasonably assured, despite the high level of European demand which has prevented any substantial build up of minehead stocks. A pronounced recovery in the level of activity in the U.S. steel industry could obviously have a significant impact on the supply position, but this seems hardly likely to take place during the present quarter.

According to the latest figures released by the Bureau of Mines, U.S. Department of the Interior, U.S. production of concentrates during the first four months of 1960 amounted to 11,230 s.tons of contained molybdenum, which compares with 25,478 tons for all 1959 and 20,535 s.tons for 1958. Stocks of molybdenite concentrate at mines and at plants making molybdenum products increased by 10 per cent in April. On the other hand, stocks of molybdenum products at producers' plants decreased in the same month by 7 per cent. Exports of molybdenum ore and concentrate from the U.S. in terms of molybdenum content, amounted in the first four months of this year to 3,610 s.tons, compared with 9,426,240 in all 1959. U.S. consumption in the same period totalled 7,431 s.tons, against 18,724 tons in all 1959.

ITALIAN QUICKSILVER EXPORTS

Italian quicksilver exports in the first five months of this year totalled 687.3 tonnes compared with 301 tonnes in the corresponding period of 1959. Total production in '59 amounted to 1,580 tonnes compared with 2,400 tonnes in 1958.

ANTIMONY CONSUMPTION INCREASING

The London market in antimony is making a better showing than for some time past. During the first half of 1960, U.K. imports of ores and concentrates totalled 9,228 tons compared with 5,370 tons in the corresponding period of 1959 and 11,223 tons in the whole of that year. Reflecting this improvement, U.K. consumption of new metal for the first five months of 1960 totalled 2,549 tons against 1,916 tons in the corresponding period a year ago. The principal usage increase has been for antimonial lead where, in addition to an increase in new metal consumption of 420 tons, the consumption of antimony in scrap rose by 650 tons making a total increase in this usage of about 30 per cent.

The U.K. price for 60 per cent ore remains unchanged at about 20s. to 21s. c.i.f. per l.t.u., but prices on the Continent are now reported to be as high as 24s.

The market in Chinese metal is also strong, with 99 per cent regulus quoted at £135-£138 c.i.f. per tonne.

ELECTROLYTIC MANGANESE

Foote Mineral Co. has authorized construction of a $6,000,000 electrolytic manganese plant at New Johnsonville, Tennessee. The plant will have an eventual capacity of 10,000 s.tons annually and is to be built in two stages, the first unit of 5,000 tons capacity being scheduled to come on stream late in 1961 or early in 1962. Foote currently has two other electrolytic plants with a total capacity exceeding 14,000 tons. The company's domestic electrolytic manganese capacity is stated to be currently adequate, the increased capacity being developed in anticipation of higher domestic and foreign demand.

Another producer to raise its output is Union Carbide Metals Co., which has announced a 20 per cent increase in productive capacity for electrolytic manganese at its Marietta, Ohio, plant, the purpose being to meet increased demand.

MORE U.S. AID FOR BERYL AND ASBESTOS EXPLORATION

The U.S. office of minerals exploration is reported to be adding to the types of asbestos and beryllium ore eligible for Federal exploration assistance. Hitherto only beryl and so-called "strategic" types of asbestos have qualified for assistance, but applications will in future be considered for all beryllium-bearing minerals and for asbestos of other than "strategic" grade.

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Two hundred tons of beryllium ore were sold recently by government auction at Buenos Aires for $339 per ton. The purchaser was the New York firm of Phillip Brothers.

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The beryllium works of the Atomic Energy Authority at Milford Haven which have been operated on an agency basis by Murex, have been sold to Consolidated Beryllium, who will take over the works on September 8, and continue operations on a reduced scale. Consolidated Beryllium, which also has beryllium operations at Avonmouth, is jointly owned by Imperial Smelting Corporation, and Beryllium Corp. of Reading, U.S.A. The company is managed by Imperial Smelting Corp., which is a wholly-owned subsidiary of The Consolidated Zinc Corp.

U.S. PLANT FOR "SPECIAL" METALS

Plans for a new $1,600,000 for fabricating "special" metals have been announced in Chicago by Mr. H. Y. Basser, president of Calumet and Hecla Inc. Zirconium and titanium will be the first of them to go into production at the new manufacturing centre. The plant is expected to be in operation by January, 1961. Initially it will produce only tubes and rods. This additional manufacturing capacity, it was stated, will enable the company to keep pace with the rapidly increasing demand for zirconium and titanium tubular products. The plant is also expected to be used at some future date in the production of other special metals such as tantalum, columbium, vanadium, molybdenum and chromium.

NICKEL STOCKPILE SALE

The General Services Administration has announced that it will put up for sale about February 1 next all the arsenical nickel ore and speiss now held in the U.S. national stockpile of critical and strategic materials. The Agency said that stocks of arsenical ore amounted to 314 s.tons, which had been acquired from North Africa during World War II. In Burma 1,400 s.tons of speiss were procured during the war. Both products were now obsolete for stockpile purposes. It is planned to offer all of both materials at one time with the ore to be divided into two lots and the speiss offered separately. Bidders will be permitted to submit offers on any one or all of the three lots. Both domestic and foreign purchasers will be invited to participate in the sale.

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U.S. State Department officials have left for Cuba to resume talks about the possible sale to Cuba of the $85,000,000 Nicaro plant owned by the U.S. Government. Negotiations were interrupted before the July 4 holiday. Operations at the plant have been sharply curtailed and the products are being stored in Cuba. The plant has a capacity of 25,000 s.tons of nickel oxide powder and sinter a year. Production is believed to have dropped to an annual level of less than 18,000 s.tons.

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Nickel is among various commodities with which Cuba is to supply China under a five-year barter agreement signed recently in Havana. Other items include cobalt, copper, manganese and chrome.

NEW SWEDISH FERROCHROME PLANT

AB Ferrolegeringar, of Trollhättan, Sweden's biggest producer of ferro-alloys, has announced the opening of a new plant for the production of ferro-

chrome. This unit, erected at a cost of 20,000,000 Swedish crowns, doubles the company's ferrochrome capacity to a new annual level of 20,000 tonnes. Some 40 per cent of all Ferrolegeringar's ferro-alloys are now exported, half of them to the U.K.

NEW ALUMINIUM PROCESS

Mr. Nathanael V. Davis, president of Aluminium Ltd., announced recently that the company would spend some $4,000,000 to build new facilities at Arvida, Quebec, for the production of aluminium " by a basically new process ".

The process, which has been under development for some years by Aluminium Ltd., employs bauxite of roughly similar grade to that used by the conventional process and does not appreciably reduce the amount of power required. It does, however, give promise of substantial saving in other elements of production cost and in the investment needed per ton of capacity.

Designed as an experimental unit, the new facilities are to have a capacity of 6,000-8,000 tons a year.

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Alcoa has announced price increases averaging ½ c. to ¾ c. per lb. The cost of pig aluminium remains unchanged, however, at 26 c. a lb. " Upward adjustments ", it was reported, are being made in some types and sizes of aluminium ingots and most aluminium mill products. These increases, effective from August 1, coincide with a rise in pay rates and other benefits under a labour contract signed last year. Price increases varying from 0.02 c. to 2 c. for alloyed aluminium ingot and aluminium mill products have been announced by Reynolds Metals, the majority of the increases ranging from ½ c. to ¾ c. per lb.

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Kaiser is closing down one of the nine potlines now in operation at its Chalmette plant, in Louisiana. Each Chalmette line is capable of producing 27,500 tons of primary aluminium a year. A few days ago the company took similar action at its Mead plant in Washington, where a 22,000 ton line was closed down. The intention, in each case, was to adjust plant inventory. Closing down the two Chalmette lines will leave the company operating at a level of about 475,000 tons, equivalent to some 78 per cent of its rated primary production capacity.

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A major breakthrough of aluminium into the U.S. can market is indicated in reports from the citrus concentrate industry. Minute Maid Corp. have announced that, beginning with the 1960-61 packing season next December, nearly all the standard 6 oz. containers to be used at their Auburndale, Florida, plant—an estimated 50,000,000—will be made of aluminium.

According to Mr. David Reynolds, vice-president (sales) of Reynolds Metals, present indications suggest strongly that nearly all the frozen citrus concentrate produced during 1961 will be packed in aluminium cans. Mr. Reynolds claimed that owing to the long hauls involved, by switching from tinplate to aluminium cans, a concentrate packer could reduce freight costs by an average of $1 per 1,000 cans for national distribution.

Another Reynolds official has forecast that more than half of California's huge tuna, salmon and shellfish output will be canned in aluminium within five years.

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According to Brazilian Press reports, what will be the biggest aluminium plant in South America is to be built on the site of extensive bauxite reserves at Pocos de Caldas in Minas Gerais. The plant is to have an annual capacity of 30,000 tonnes, state these reports, and will be operated by a company with a capital of $U.S.36,000,000, half in U.S. and half in Brazilian hands. Firms mentioned in connection with this project are Alcoa, Reynolds Metals and Hanna. Production is expected to begin in 1963.

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The Australian Aluminium Co. has completed plans—nearly two years ahead of schedule—for a further expansion of its rolling mill and extrusion facilities in Sydney. This has been announced by the joint owners of this concern, Aluminium Ltd. and the British Aluminium Co. The new expansion programme calls for an increase of 4,500 l.tons per year in rolling mill capacity and an additional 1,700 l.tons capacity for extruded products. When the programme is completed in 1963, the Australian company will have annual capacity to produce a total of some 20,000 l.tons of rolled products and 9,000 tons of extruded products.

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The Australian Aluminium Production Commission and a Swiss company, Aluminium Industry Aktien Gesellschaft, are reported to have reached agreement for the supply of technical services in the installation of additional plant at the Bell Bay aluminium smelter in Tasmania. The project will take about three years to complete and will cost around £A.3,000,000.

U.S. TITANIUM PRODUCTION RISES

Production and shipments of titanium mill products in the U.S. increased in May to 405 s.tons from 268 tons in April. Ingot production rose by 20 per cent to 743 s.tons from the previous month's figure of 607 tons. Domestic consumption of ingot totalled 694 s.tons in May against 551 tons in April. In the first four months of the current year total shipments of ingot amounted to 1,643 s.tons, equivalent to more than half the entire quantity shipped in 1959.

FERROALLOYS IN JAPAN

Japanese ferroalloy producers are reported to be considering a plan to restrict their production voluntarily in the current quarter from July to September. According to the Japan Ferroalloy Producers' Association, ferrochrome production during the April-June quarter reached 25,000 tons, but for the current quarterly period it is expected to be 21,000 tons, or 4,000 tons less than the original production plan. Under the original plan, production during the period of the first half year from April to September was estimated at 50,000 tons, which would bring the total for the 1960-61 financial year to 90,000 tons.

During the April-June quarter, export shipments of ferrochrome amounted to about 3,000 tons. Export contracts have so far been concluded for about 17,000 tons, chiefly of low-carbons. Domestic sales during the same period averaged about 6,000 tons monthly, retaining the previous high level. However, in anticipation of curtailment of special steel production, the output of high-carbon ferrochrome is likely to be held down in the coming months.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

The market has been lacking any fresh features during the week and with the Bank Holiday intervening, business has been on a restricted scale. Whilst copper values have been well maintained and the undertone of the market remains strong, tin, lead and zinc values have all failed to maintain recent levels. Undoubtedly this reaction can, to some extent at any rate, be attributed to seasonal factors.

KATANGA SITUATION PRIME COPPER MARKET FACTOR

The copper market continues to be dominated by day to day developments in Central Africa. In this respect uncertainty as regards the future of the Katanga Province of the Belgian Congo is still the prime factor. News was received during the week that the African Mineworkers' Union, on behalf of its 30,000 members, had lodged a claim for increased wages with the Chamber of Mines. The present agreement expired at the end of June, having been in force since November, 1958, when the last increase was granted following lengthy negotiations.

In addition to these two main sources of trouble, the possibility of a strike early in October at the Chuquicamata mine in Chile must be borne in mind, and already it has been reported that the cutting out of overtime until the end of September and the deliberate slowing down in some departments, is resulting in the loss of some 3,000 tons of copper a month.

Although consumer demand remains quiet with many U.K. and Continental works closed for holidays, the London quotation has been fully maintained and with a modest increase of 80 tons in U.K. official warehouse stocks last week, the backwardation has remained at the recent level. In the U.S. business is quiet and both customs smelters and main producers selling at 33 c. report only routine business. In spite of this and excess

(Continued overleaf)

Metals and Minerals (Continued)

production, however, it is generally considered that the price can be held at this level, bearing in mind the situation in the Congo and Northern Rhodesia. It may be noted that these two producing centres combined account for nearly 27 per cent of the Free World's output. The U.S. scrap price is still quoted at 25½ c. with offerings moderate.

TIN MOVES LOWER

Somewhat freer selling of tin has been noted during the week and in the absence of sufficient consumer interest, both in Europe and the U.S., the prices in London have moved lower. The Eastern price, however, has remained very steady and on Thursday was equivalent to £830⅛ per ton c.i.f. Europe. It was announced during the week that at the end of March last 10,030 tons of tin were held in the buffer stock as compared with 10,050 tons at the end of December.

QUIET LEAD-ZINC MARKETS

The main feature of the lead market has been the almost complete disappearance of the contango since the latter part of the second half of the July trading period, which indicates appreciably less pressure on the market of Continental supplies. In the case of zinc, the adequacy of nearby supplies related to current demand is shown up in the near elimination of the backwardation, but in both markets conditions are quiet and the picture could alter as soon as consumers re-enter the market.

In the U.S., zinc demand from the die-casting industry has shown some improvement during the week, whilst lead consumption in May increased 9 per cent over April; inventories at both producer and consumer plants were higher at 248,700 tons compared with 242,900 tons at the beginning of the month. The dispute at the Consolidated Zinc Corporation Ltd.'s properties in Australia, which closed down operations on July 12, has not yet been resolved.

Closing prices are:

	July 28		August 4	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£252½	£253	£251½	£252
Three months ..	£247	£247½	£248	£248½
Settlement ..	£253		£252	
Week's turnover	7,825 tons		6,575 tons	
LEAD				
Current ½ month	£71¼	£71½	£70⅞	£71
Three months ..	£71¼	£71½	£71⅛	£71⅜
Week's turnover	5,550 tons		4,400 tons	
TIN				
Cash	£815½	£816	£812	£813
Three months ..	£816½	£817	£813	£813½
Settlement ..	£816		£813	
Week's turnover	1,345 tons		610 tons	
ZINC				
Current ½ month	£89½	£89¼	£89½	£89⅜
Three months ..	£89¼	£89½	£89	£89¼
Week's turnover	4,525 tons		2,225 tons	

London Metal and Ore Prices appear on inside back cover.

Mining Finance

Nchanga's Output Expansion

The bumper results of Nchanga Consolidated Copper Mines for the year to last March revealed by the preliminary statement, commented on here on July 15, are shown in the full report to have been due to the known factor, namely a higher metal price, and also to the unknown factor (in the absence of quarterly reports) of increased output. Various guesses were made at the time as to how much this Anglo American group mine's production had expanded. In the event, the most optimistic forecast proves true, copper output having risen by 38,603 tons to 178,045 tons.

And this is by no means the end of the Nchanga production story. While reiterating that he is prepared to join in any scheme aimed at curbing copper supplies in order to prevent severe price recessions, the chairman, Mr. Harry Oppenheimer, says that Nchanga's output for the current year to next March is geared " at much the same level as last year ". On top of this plans are in hand aimed at adding another 15,000 tons per annum by improvement in extraction methods at the relatively modest cost of between £2,000,000 and £3,000,000.

It is probably true to say that in light of the medium-term outlook for copper consumption in relation to supplies, the Nchanga directors see no reason to embark on the really major scheme that would be needed if the full potentialities of the mine and open pits were to be realised. This would not necessarily mean any great project on the mining side. It would, however, require substantial additions to the group's smelting and refining facilities.

So at present Nchanga is confining itself to a scheme for installing improvements and extensions at the leach plant which the consulting engineers think should result in a marked improvement in the efficiency of extraction. It is also their opinion that the efficiency of the Rhokana smelter, which handles concentrates from Nchanga and Bancroft, could be improved by diverting some of Nchanga's concentrates to its own leach plant. The whole plan is understood to be completed in outline and the initial economic assessment of the proposals is stated to be " most encouraging ". Meanwhile, more detailed technical investigations are being proceeded with.

All this leaves Nchanga with most encouraging prospects for the current financial year providing that Central Africa's racial troubles do not interfere with operations. The price of copper during the first quarter has been well sustained. There is, of course, some danger that it will fall away if the world's production centres remain unimpeded by strikes, even allowing for some reduction in output from the Congo. Last year Nchanga received an average of £240 a ton for its metal against £204 in 1958-59. Present London price of cash copper is £254.

At 52s. 6d. Nchanga £1 units offer a yield of 13.3 per cent on the 1959-60 payment without allowing for double tax relief. This is indeed a measure of the nervousness with which investors, both private and institutional, are regarding Rhodesia as a haven even for that portion of their money on which a high return would be welcome.

JANTAR v. BISICHI : LAST ROUND?

When commenting on the Bisichi-Jantar battle in our issue of July 22 we said that the Bisichi offer was not a good one, but whether the Jantar Board could establish this point only time would tell. Now Bisichi has extended until August 13 the closing date for its offer of one Bisichi share plus 1s. in cash for each Jantar share and it has answered in great detail the last Jantar circular setting out the reasons why the latter's directors did not recommend the deal.

It is notable that very little is said in Bisichi's reply about the water situation which seems to be the crux of the matter. It is stated that Bisichi's production of primary columbite is not restricted by any shortage of water. When the company acquired the primary columbite area it also acquired water rights on adjoining areas and is " satisfied that these are sufficient for its purposes ". Output figures, it is claimed, destroy the water difficulties theory put forward by Jantar.

The argument about the respective ore reserves goes on as does that about the companies' London expenses. Bisichi also continues to insist that " real reductions in cost " will be achieved by the amalgamation. On the whole there still seems to be no very powerful reason why holders of Jantar should desert their present board. It is, however, a virtual certainty that if they feel like doing so then this is their last chance. Bisichi says that no improved offer will be made.

STRIKE AT CONS. ZINC CONTINUES

The Consolidated Zinc Corporation Ltd. reports that the industrial dispute at The Zinc Corporation Ltd. and New Broken Hill Consolidated Ltd., which resulted in a cessation of operations at midnight on July 12, continues.

The management of the companies has called a number of conferences and several mass meetings of Unionists have been held. At the last three of these meetings the Union's Executive has put forward the companies' suggestions and advocated a return to work, with an approach to a third party if further negotiations between the Union and companies break down. At their last meeting on July 27 the men refused to approach a third party.

The Industrial Commission of New South Wales, being opposed to direct action, has declined so far to mediate while the men are on strike.

CHARTERED'S BUOYANT REVENUE

Estimated gross revenue received by the British South Africa company (usually known as Chartered) from mineral royalties, rents and fees in the June quarter was a little lower than in the first three months of the year, probably the result of a slightly reduced average copper price. Production from the Northern Rhodesian mines is likely to have been buoyant during the period. It usually is in this June quarter, which marks the close of most of the mines' financial years.

After allowing for the payment to the Northern Rhodesia Government of 20 per cent of the net revenue from the royalties, the June quarter figure of £3,025,000 compares with £3,076,000 in the March quarter. The impressive way in which income from this source is building up in Chartered's current financial year to Sept. 30 next is clearly shown in the accompanying table.

The nine months' aggregate for the present year of £8,771,000 compares with £6,718,000 at this time twelve months ago, a rise of £2,053,000 or 30 per cent. The adjusted total for 1958-59 that appeared in the actual accounts was £9,395,827. Allowing for some slackening in production activity in the current quarter it seems fair to assume in view of the strongly maintained metal price that Chartered's total from this source for 1959-60 may reach at least the £11,500,000 neighbourhood. So, with higher income from investments also in prospect (this brought in £2,218,942 last year), it is now virtually certain that the company's profits available for distribution will be substantially higher.

Each year Chartered is allocating substantial sums from earnings in order to ensure that the company will be able to carry on as an investment concern when the mineral rights are ceded to the Northern Rhodesia Government in 1986. In the boom year of 1955-56, when the net profit was just on £7,000,000, the huge amount of £9,500,000 was put to general reserve, but this included a substantial draft from a carry-forward of £7,200,000. Since then appropriations to reserve have ranged between £1,500,000 and £2,500,000 and the carry-forward is now £2,400,000.

Any estimates of what the higher 1959-60 earnings will mean in the way of increased dividend can thus be little but guesswork at this stage. Some guide to Board policy may be given early next month when the interim is due to be declared. Last year this was raised from 1s. 3d. to 1s. 6d. per 15s. stock unit. The final was 4s. 6d. The really important date, however, is next February when the 1959-60 final will be decided. If the outlook for the Rhodesian Federation is still stormy there will obviously be a temptation to increase the amount put aside for investment outside Africa. Chartered has sensibly been pursuing a policy of diversification in this respect for some years now.

The market naturally thinks that something in the way of an increased payment must be forthcoming, but this has little effect on the units despite the current yield of around 8 per cent. Chartered, in fact, continue to be swayed by the waves of nervousness about the whole situation in Central Africa and are hardly being stimulated at the moment by a demand for increased wages by the African workers on the Copperbelt. If these are granted the higher costs will not, of course, have any effect whatsoever on Chartered's royalties. But any interruption of production caused by a strike certainly would have.

	1958-59	1959-60
	£	£
Dec. Quarter	1,489,000	2,670,000
March Quarter	2,500,000	3,076,000
June Quarter	2,729,000	3,025,000
Sept. Quarter	2,544,000	—
Year	9,262,000	8,771,000*

* Nine months to date

★

Mr. S. H. Robinson has been appointed as an alternate director of Ghana Main Reef to Mr. C. J. Burns.

★

At a board meeting of Selection Trust, Mr. C. B. Forgan and Mr. E. C. Wharton-Tigar, were appointed directors of the company. Mr. Forgan is the company's consulting engineer and Mr. Wharton-Tigar is managing director of Consolidated African Selection Trust.

LONDON MARKET HIGHLIGHTS

Following the improvement that had developed in the second half of the previous week, South African Gold shares once more lapsed into dullness after the August Bank Holiday. The modest buying support from Johannesburg dried up and a trickle of local sales—there was never any heavy selling—were sufficient to cause an all-round setback in share prices. Sentiment was not helped by events in the Congo or by the news that South Africa is to extend its controversial pass laws to all African women over the age of 16.

The news that the Union has decided on October 5 as the date for a referendum on the question of becoming a republic was received here with mixed feelings. On the one hand it was pointed out that uncertainty is the most depressing influence in any share market and therefore it would be a good thing to get the republic question cleared up as soon as possible. On the other hand, it was clear that the few cautious buyers that have shown their hand recently are unlikely to be encouraged for the time being.

The July monthly returns proved to be featureless for the most part, although some new record profits were set up by Winkelhaak, Western Holdings, Harmony, Blyvoor, Doornfontein and Buffels. These figures made practically no difference at all to share prices in the general dull state of the market. Western Holdings dipped 2s. 6d. to 115s. in common with Free State Geduld. Winkelhaak's now consistently rising earnings did no more than save the price of 22s. from falling with the general dullness that developed on Wednesday.

Platinum shares had been one of the very few firm spots under the stimulus of Johannesburg optimism regarding next month's dividends. But by mid-week one or two profit takers pared the earlier gains.

Congo developments continued to overshadow the Copper section. For a short while Chartered resisted the trend, rising 1s. to 75s. following another good quarterly report coupled with hopeful dividend forecasts, but soon eased back to 74s. again. Messina wilted to a low for the year of 18s. 4½d. when the recent modest Johannesburg demand petered out.

Despite the imminence of an excellent annual report, Nchanga sagged to 51s. 10½d.; at this price Nchanga yield fully 13.5 per cent before taking double taxation relief into account. Closely tied to the Congo and Katanga Province via their important stake in Union Miniere, " Tanks " eased back to 30s.

Tin shares moved rather narrowly with investment interest back at a low ebb. The Nigerian tin and columbite producer Jantar stayed at around 6s. 3d., many investors being apparently prepared to await the outcome of the strongly resisted takeover bid made by the neighbouring Bisichi.

Lead-zincs also failed to develop any decided trend. But there was some fresh Australian support for Mount Isa and the shares moved up 1s. 3d. to 54s. 3d. Consolidated Zinc (75s. 6d.) also became a firmer market on a revived investment demand. Elsewhere, Yukon Consolidated improved to 4s. 3d. on the view that they were a good non-African investment to hold for those hopeful of a coming rise in the U.S. price for gold. St. John d'el Rey weakened 10s. more to 75s. on some U.S. selling in a narrow market.

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NCHANGA CONSOLIDATED COPPER MINES LIMITED

(Incorporated in Northern Rhodesia)

RECORD PRODUCTION

Group Contribution to African Education

The following is from the statement by the Chairman, **Mr. H. F. Oppenheimer,** which has been circulated with the reports and accounts :

The results of our operations during the year ended March 31, 1960, were very satisfactory. Production at 178,045 long tons was some 38,000 long tons higher than the previous year which was itself a record. This high rate of production, most of which was sold at an average price of £240 per ton, compared with £204 per ton last year, resulted in a net profit for the year after taxation of £13.64m.

Plant Extension Proposals

As you are aware, the two open pits on our property yield oxidized ores, while the ore mined underground is in sulphide form. Most of the sulphides are treated at the Rhokana smelter and most of the oxides at the leach plant at the mine. The consulting engineers are investigating a scheme for installing improvements and extensions at the leach plant which they believe might result in a marked improvement in the efficiency of extraction. It is also their opinion that the efficiency of the Rhokana smelter which handles concentrates from our mine and from Bancroft could be improved by diverting some of our concentrates to the leach plant.

Preliminary estimates indicate that the cost of the extensions required would be between £2 and £3 million, and it is hoped that it will be possible in this way to produce an additional 15,000 tons of copper a year without increasing the rate of mining. The initial economic assessment of these proposals is therefore most encouraging, and the consulting engineers are proceeding with more detailed technical investigations.

During the year we subscribed for a further £1.08m. of Federal Government Development Bonds which leaves about £1m. of our commitment still to be subscribed. To provide the money needed for this purpose, and to strengthen the company's cash position, we have transferred £1.5m. to general reserve. It is very satisfactory that we have been able to make the appropriations to which I have referred and at the same time are able to recommend a net final dividend of 5s. 6d. per stock unit, which, together with the interim dividend of 1s. 6d. makes a total dividend of 7s. 0d. net per stock unit for the year. Our distribution in the previous year was equivalent to 3s. 1¼d. per stock unit on the present issued capital.

About 13,000,000 tons have been added to the accumulated ore reserves which at the year end stood at 180,019,000 tons with an average grade of 4.65 per cent copper. There is little doubt that considerable further ore reserves will be proved by additional exploration work in the future.

Copper Price

For the first three months of the new year, the price for copper has remained relatively steady at satisfactory levels. There is evidence of an increase in consumption of the metal, particularly in the United Kingdom and on the European Continent, which are our main markets, and the general outlook is therefore encouraging.

While consumption at the moment appears to be keeping pace with increasing production, the dual risks of interruption of supplies or falling off in demand are always present. The former risk is one against which consumers can insure themselves by a rational stockholding policy, and the manner in which the copper fabricating industry weathered the prolonged strikes in America last year indicates that this is being done.

It is for the copper producers to protect themselves against the latter risk and to prevent the recurrence of price recessions such as that of 1956/57 by regulating supplies to meet demand. We have indicated that if such a situation arises again we are prepared to play our part by joining with other major producers in either reducing production or withdrawing copper from the market.

Meanwhile production at the mine is geared for the present year at much the same level as last year.

The past year has been a time of political difficulty and uncertainty in the Federation. Fortunately, operations at the mines have not been adversely affected, but the industry is, of course, deeply concerned with the future of all the people of the Federation.

African Education

We believe that many of the difficulties—political, economic and social—arise from lack of educational facilities for the African inhabitants and that the mining industry should play a direct part in remedying this situation on the Copperbelt. In his review of the year ending March 31, 1956, my father said that we had reached the conclusion that urgent attention needed to be given to improving African educational facilities, and that we were examining the whole question to see what help we could give. The subsequent severe reduction in the price of copper prevented us from realizing the plans that were then formulated.

The question has, however, remained in the forefront of our thinking, and the mines administered by the Anglo American Corporation were therefore very happy to join with the Rhodesian Selection Trust group of companies in agreeing to make available the sum of £1.3m. to enable the Northern Rhodesian Government to expand educational facilities on the Copperbelt. The scheme envisaged will mean that every African child on reaching the age of eight will be admitted to a course of at least six years of primary education, and provision will also be made for an extension of facilities for secondary education and of the adult educational activities which are already carried on by the mining companies. In addition, the copper mining companies which sponsored the Copperbelt Technical Foundation have joined with the Federal and Territorial Governments in arranging for a survey to be made of the requirements for technical education and the needs of industry in Northern Rhodesia.

Company News

David Brown Corporation of Huddersfield and Foote Bros. Gear and Machine Corp., of Chicago, have issued a joint statement announcing the formation in Toronto of a jointly-owned company, David Brown - Foote Gears Ltd., which will take over the sales and distribution in Canada of gear transmission and chain products manufactured by both companies and their associates. David Brown (Canada) Ltd., of Toronto will in future concentrate on marketing David Brown tractors and farm machinery, and Mr. E. Percival will continue as the firm's general manager. He will also be a member of the board of David Brown-Foote Gears Ltd., of which Mr. R. W. Johnson, has been appointed vice - president and general manager. Foote Bros. Gear and Machine Corp., have taken over the Gear Division of David Brown Inc., of California, and will be responsible for the sales and distribution of David Brown gear products in Western U.S.A.

★

An order, worth about £700,000 for electrical equipment for a new rod mill has been obtained by the Heavy Plant Division of Associated Electrical Industries from the Broken Hill Proprietary Co., Australia. The mill will be driven by direct current motors ranging in output from 600 to 2,500 h.p., and the total power available will be 17,700 h.p. Mercury-arc rectifiers, rated in all at 13,000 kW., will supply the mill motors, and the order includes switchgear, control gear, and auxiliary drives. Most of the electric control equipment required will be manufactured in Australia by Australian Electrical Industries (Pty.), responsibility for manufacturing the rest being divided between the Rugby and Manchester works of A.E.I.

★

Padley and Venables announce that their London office has moved, the new address being : Clutha House, 10 Storey's Gate, London, S.W.1. Telephone : WHItehall 0678/9.

★

A cargo of 300 transport cars, built by Robert Hudson Ltd. of Leeds is expected to be amongst the first shiploads to reach Canada's Hudson Bay this season after the break-up of the ice. The transport cars have been ordered by International Nickel for service at the new refinery at Thompson Lake, Manitoba.

INDIAN COPPER CORPORATION

ANOTHER SATISFACTORY YEAR'S OPERATION

MR. PATRICK E. G. W. PARISH'S REVIEW OF ACTIVITIES

The 36th annual general meeting of Indian Copper Corporation Limited was held on July 27 in Calcutta.

Mr. Patrick E. G. W. Parish, O.B.E. (the chairman), who presided, said:

It is a fact that, if all Copper Mines throughout the world worked to capacity, production would exceed current consumption. In that event prices would be bound to fall. During the year 1959, however, strikes took place in various mines, especially in America, with the result that production was curtailed, world stocks were reduced and a consequent rise in price took place.

For the first ten months of the year the average London Metal Exchange price for this metal fluctuated within small limits around £230 per ton, and thereafter steadily increased to a maximum figure of £255 per ton in December. There were further increases in price for the first few months of this year, followed by a small decline, but at present the price appears to be steady around £255 per ton.

As regards the future, it would seem that, if settled conditions return, stocks will increase and prices are likely to fall unless some of the world's larger producers voluntarily agree to restrict output.

Working Review

Your Company's production of Fire-Refined Copper during 1959, but for an unfortunate breakdown in the Smelter during December necessitating the annual shutdown for repairs a month early, should have been another record. However, it is expected that the shortfall of 1959 will be made good during this year, provided there are no other unforeseen setbacks.

Copper consumption in India at present is about 50,000 tons per annum against which your Company, the only indigenous mine, produces about 8,000 tons. Naturally the price at which our Copper is sold is linked to the price of imported metal.

The more copper we can produce the less foreign exchange will be required for imported metal. The steady increase in production during recent years is planned to continue in line with the further development of the Mine. This will obviously require considerable further capital expenditure which will have to be met in the years ahead. In particular, a new Crushing Plant, Smelter and a small Concentration Plant will shortly be required to deal with the increased ore output and these items alone will cost something in the neighbourhood of £1,000,000.

Prospecting throughout our leasehold continues, but results so far cannot be regarded as particularly favourable and do not at present indicate that any major deposits which might be equal in size to your Mosaboni and Badia Mines are available. These prospecting operations have been intensified over recent years; it is premature to forecast what final results will eventually be obtained.

Ore reserves have again increased from 4,034,147 short tons to 4,203,547 short tons despite the decrease of 35,793 short tons in Badia Section. This has been achieved by concentrating on development at depth in the Mosaboni Mine and on development of the new small mine—Surda.

The satisfactory final results for 1959 are directly attributable to the increased selling prices. As I predicted last year, the working costs have increased due to the necessity of mining at greater depths. There has also been a further increase in these costs as a result of lower production and heavy maintenance charges.

Once again I am pleased to inform you that during 1959 relations with the employees remained satisfactory. The three-year Agreement with the Mines and Works Unions is at present under review and negotiations are taking place between the Management and the Unions to try to arrive at a new settlement.

Kyanite

The demand for our raw material in world markets continues to be satisfactory despite the increased consumption of synthetics and competition from other sources. New world markets are being sought and there are hopeful signs that provided prices can be kept at competitive levels, it may be possible to recapture certain established markets, particularly in America. Our exports to the U.S.A. last year amounted to approximately 20% of all our exports.

At the moment I have nothing further to report concerning the suits in regard to your Company's Kyanite Leases, as they are subjudice in the Supreme Court.

Electrolytic Project

All matters appertaining to the Electrolytic Project for the installation of a Refinery and Foundry for the manufacture of Electrolytic Copper and Wire Bar have been finalized, and I am pleased to report that a start has already been made to implement the scheme. The proposal is to utilize some or all of the Company's production of copper supplemented, if required, by the importation of Blister Copper for the Refinery. At the same time the production of Rolled Copper and Brass Sheets will be continued as in the past. The target date to commence production of Electrolytic Copper is the end of 1962.

Accounts

The profit for the year before providing for Taxation, Depreciation and Reserves amounts to £1,202,259. Your Directors have decided to place £175,000 to Depreciation and £125,000 to General Reserve. Income Tax and Super Tax on profits for the year amount to £439,949.

Your Directors recommend a Dividend of 27% subject to deduction of tax, which gives a slightly higher nett yield than the Dividend of 18% free of tax paid in the previous year. You are no doubt aware that, under the Income Tax laws, dividends now have to be declared subject to deduction of tax. With these proposals £107,121 will be carried forward.

The report was adopted.

Personal

Mr. T. B. Adkins general manager of the Ore Mining Branch of the United Steel Companies Ltd., for the past 13 years, retired on June 30, after 56 years with the company. He is succeeded by Mr. D. R. Ward Jones, who was previously assistant general manager of the Ore Mining Branch.

★

Nigel Finance and Investment announce that Mr. Reginald Franklin was appointed alternate director to Major Sir Cyril F. Entwistle on the board of this company and of its wholly-owned subsidiary, Bective Investments.

★

Consequent upon the recent transfer of control and management of St. John d'el Rey Mining Co., to the U.S.A., Mr. A. L. Yarnell has resigned as a director and ceases to be managing director. Mr. Yarnell is taking up an appointment with the Bank of London and South America.

★

The Mond Nickel Co., announce that Dr. G. L. J. Bailey has relinquished his position as superintendent of Mond's Development and Research Laboratory in Birmingham and will transfer to London to become manager of research. Mr. E. J. Bradbury succeeds Dr. Bailey at Birmingham.

★

Belliss and Morcom announce two new appointments as a result of reorganizing their sales activities. Mr. W. A. Cusins, London manager, has been appointed sales manager and will be responsible for all sales in the Commonwealth and foreign markets, and Mr. B. Noble, assistant sales manager, has been appointed home sales manager, and will be responsible for the sales organization in Great Britain.

★

The Export Credits Guarantee Department announces that the President of the Board of Trade has appointed Mr. J. N. Hogg as deputy chairman of the Department's Advisory Council, following Sir Richard Jessel's resignation through ill health.

★

Goodyear Tyre and Rubber Co. (Gt. Britain) announce the following changes in their Industrial Products sales organization: Mr. W. U. Chapman, previously manager of Goodyear Industrial Products Department has been transferred to the Export Sales Division of the company, and Mr. J. T. Pearson is to succeed Mr. Chapman in his previous position.

★

The board of Head Wrightson and Co. announce the appointment of Mr. W. H. Adams as general manager of Head Wrightson Iron and Steel Works Engineering, Ltd., and of Mr. J. D. Eccles as general manager of Head Wrightson Steel Foundries Ltd.

★

Mr. A. B. Coussmaker has been elected chairman of Johnson Matthey and Co., in succession to Mr. G. C. H. Matthey, who is retiring from the chair, but remaining a director.

Professional Directory

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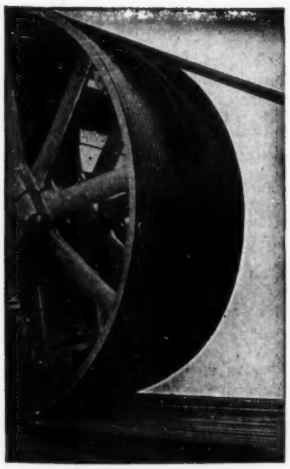

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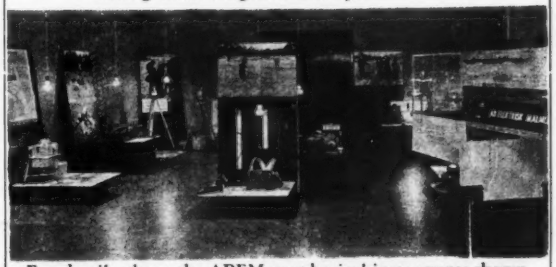

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THE ABEM COMPANY
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Telegrams: Prospecting

BOOK REVIEWS

Metallurgy of the Rarer Metals No. 7. *Beryllium, by G. E. Darwin and J. H. Buddery. Butterworths Scientific Publications Ltd., London. pp. 392. Price 70s., by post 2s. 6d. extra.*

Few of the newer metals have more exciting potentialities than beryllium, provided the formidable problems associated with its development as a structural material can be solved. And there is no reason to doubt that effective solutions will be found. These problems range from the cost and difficulties of extraction — all commercial supplies of beryl are at present obtained by hand picking, as no satisfactory mechanical or flotation process has been developed— to the brittleness of the metal and the discovery that under certain conditions beryllium and its compounds are very highly toxic. Safe working conditions have been established, however, while fabricating difficulties have been eased by the adoption of powder metallurgical methods.

The beryllium industry grew up between the two wars mainly on the strength of the beryllium-copper market, with a small but increasing outlet for beryllia. For twenty years beryllium was considered mainly for its excellent properties as an alloying material, and this form still accounts for at least 80 per cent of its end uses. Both beryllium and beryllia, however, have been found to be of outstanding interest for nuclear purposes, notwithstanding the incompletely solved brittleness problem, and two industrial methods of producing the metal are operated on a commercial scale in the U.S. and France. A solution to the brittleness problem would also open a wide field for beryllium as a structural material where lightness and rigidity are at a premium, notably in long-range aircraft and missiles.

Particularly timely, at this stage of beryllium's development, is the publication of this important textbook, in which existing knowledge is concisely presented. The authors are members respectively of Babcock and Wilcox Ltd., London, and A.E.R.E., Harwell. They have summarized the different extraction and fabrication routes for the metal and have given its properties in detail. Because of its importance a chapter has been devoted to beryllia and, in view of probable developments, another to alloys based on the metal. Because of the author's own interest, and the British development of beryllium as a material for nuclear reactors, weight has been given to this aspect. The text is illustrated throughout with photographs, diagrams and graphs and contains many useful tables.

Mine Ventilation. *Edited by A. Roberts, M.Sc., Ph.D. 363 pp. 127 illustrations. 29 tables. Published by Cleaver-Hume Press Ltd., London. 70s.*

Written by a team of five lecturers of the postgraduate mining school in the University of Sheffield, "Mine Ventilation" is a most attractive addition to mining literature. In its fifteen chapters is to be found material presented by the various co-authors to students attending postgraduate courses in mining covering the entire field of mine ventilation. Somewhat unfortunately, although the book sets out to be a text book for University degree students and those preparing themselves for comparable professional examinations, some of the treatment is rather cursory. There are, for example, almost no worked examples representative of the types usually met with in advanced examinations and formulae are introduced into the text without appropriate derivation. This is a serious omission particularly for the student to whom ventilation is a new subject. If the book was only intended as an advanced work it is perhaps unnecessary to devote three half page graphs to a very elementary exercise concerning the determination of quantity of air required in cubic feet per minute corresponding to various methane emission values, tonnage and gas dilution. As a reference book "Mine Ventilation" is much more acceptable in that it serves admirably to collate much of the existing knowledge of this important subject both from the research and practical spheres.

Whilst certain of the chapters are excellent others leave something to be desired both as regards content and presentation. Perhaps this is due to the difficulties always experienced with multiple authorship, together with the apparent aim of the editor to cover a wide field in a single textbook.

A critical student of mine ventilation using the book purely as a reference work could possible find certain arguments developed in the text rather confusing. When considering mine fans, for example, the text is not too clear regarding the significance of an outlet diffuser fitted to a fan system. On p. 182 the statement is made that no evasee or outlet diffuser is required with a forcing fan. However, consideration of the problem will show that the addition of an outlet diffuser on any fan system, whether a forcing or exhausting, must convey equal benefit. Given identical duty, fan performance is not affected by its position in the ventilation system.

These criticisms, however, do not materially detract from the value of the book as a whole. "Mine Ventilation" is an extremely useful publication both as regards scope and treatment and is worth every penny of its purchase price.

The Geology of the Richtersveld, *by John de Villiers and P. G. Söhnge. Published by the Union of South Africa Department of Mines, Geological Survey, Memoir 48, pp. 266, Price £1 15s. 6d.*

Because of its arid and mountainous nature and consequent inaccessibility the region known as the Richtersveld, situated in the northwestern part of the Cape Province, has always remained comparatively unknown. Largely for this reason it has come to be regarded by the romantically minded as an area endowed with fantastically rich mineral deposits. This fond hope has persisted, notwithstanding the results of a reconnaissance survey made by the late Dr. A. W. Rogers of the Geological Survey towards the beginning of the century.

After the Second World War began the Geological Survey embarked on a programme of exploration for strategic minerals. This time it was decided to investigate the area in sufficient detail not only to decipher its complex geological history and structure, but also to assess satisfactorily its economic potentialities. This gigantic task, involving the detailed geolog.cal mapping of exceedingly difficult terrain with a very complicated geology, was entrusted to Drs. Jon de Villiers and P. G. Söhnge, who finished the fieldwork in three winter seasons of 1943, 1944 and 1945.

The investigation disclosed very little that was new in the way of mineral deposits, but old copper workings at Kodas, Numees and Turacip were reinvestigated and are here described, as are various minor prospects for copper and other ores. The marine diamond deposits of the State Alluvial Diggings are treated in some detail, and gypsum and limestone, of which latter very large reserves are present in the area, are cited as examples of deposits with future economic potentiality.

Although the region, or the major portion of it, does not offer immediate economic prospects, it is of considerable importance from the purely geological and particularly the stratigraphic point of view.

Mica has been produced in Canada for many years, but is not at present being mined extensively there, chiefly because of cheap production in other countries. Canada was, however, once the world's leading producer of phlogopite mica, and mining for muscovite mica was particularly important during World War II. A full report *Mica Deposits of Canada*, has now been published by the Department of Mines and Technical Surveys.

A few years ago the author of this report undertook, on a part-time basis, a comprehensive study of mica deposits of Canada, with particular interest in their geology. The principal deposits were examined and other data was compiled from various sources. This report will be particularly useful in the event of increased demand for Canadian mica.

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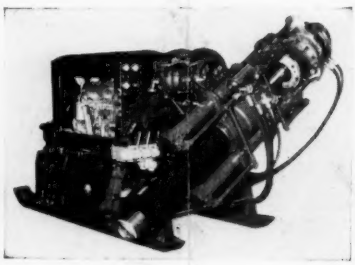

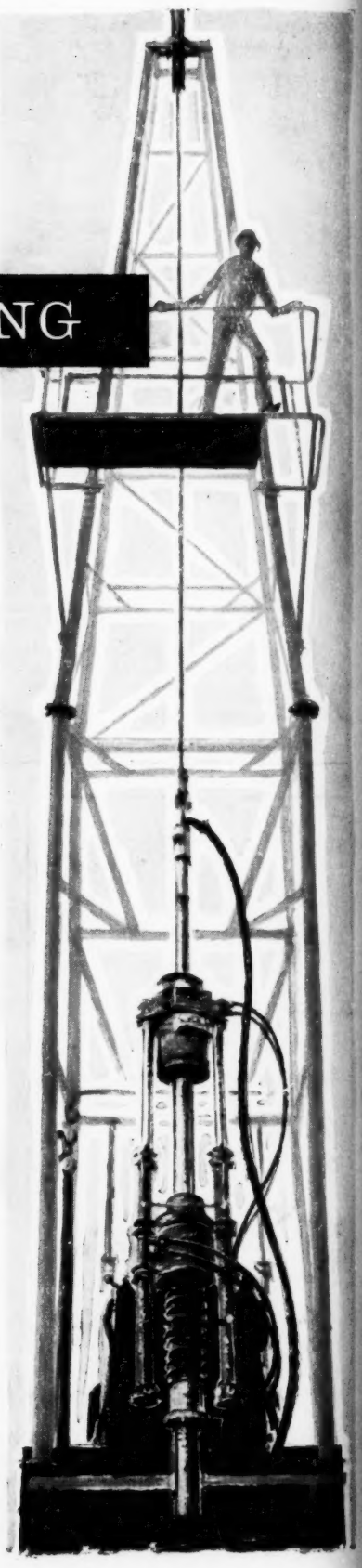

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